



Emergency Mental Health and Addictions Services (EMHAS) Relocation and Emergency Department (ED) Expansion

115 Delhi St.
Guelph, ON
N1E 4J4

PROJECT MANUAL

VOLUME 1 OF 2

SPECIFICATIONS

Architectural, Structural, Civil, and landscape
Divisions 00-33

Stantec Architecture Ltd.

100-401 Wellington Street
Toronto, ON M5V 1E7

Project No.: 140022022

Issued for Tender

June 11, 2024

Stantec Consulting Ltd.

Civil Engineering
Landscape Architecture
Structural Engineering

Chorley + Bisset Ltd.

Mechanical Engineering
Electrical Engineering
Plumbing Engineering

Brian Ballantyne Specifications

Architectural Specifications Consultant

Spyder SC

Door Hardware Consultant

Project Directory and Seals

1.1 Document Responsibility

- .1 Refer to Project Manual, Section 00 01 10 - Table of Contents, for indication of document responsibility (DR). Abbreviations for entity responsible for document preparation are as follows:
 - .1 A - Denotes documents prepared by Architect.
 - .2 C - Denotes documents prepared by Civil Engineer.
 - .3 E - Denotes documents prepared by Electrical Engineer.
 - .4 H - Denotes documents prepared by Architectural Hardware Consultant.
 - .5 L - Denotes documents prepared by Landscape Architect.
 - .6 M - Denotes documents prepared by Mechanical Engineer.
 - .7 O - Denotes documents prepared by Owner.
 - .8 S - Denotes documents prepared by Structural Engineer.
 - .9 W – Denotes documents prepared by Wayfinding Consultant.
- .2 Professional seals if applied next to company names in the project directory (below) govern only those specification sections and schedules identified by the corresponding document responsibility (DR) abbreviation in Section 00 01 10.

1.2 Project Directory and Seals

- .1 Owner:

Guelph General Hospital
115 Delhi Street, Suite G01
Guelph, Ontario
N1E 4J4

Tel: 519-822-5350

Contact: Dan Brzak
Tel: 519-837-6440 ext. 3630
Email: dbrzak@gghorg.ca

Project Directory and Seals

.2 Architect (the *Consultant*):

Stantec Architecture Ltd.

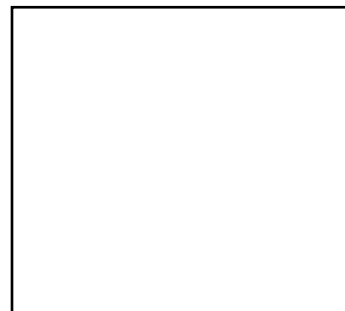
401 Wellington Street West, Suite 100
Toronto, Ontario
M5V 1E7

Tel: 416-596-6686

Contact: Tim Eastwood, Senior Principal

Tel: 416-598-5181

Email: tim.eastwood@stantec.com



.3 Structural Engineer:

Stantec Consulting Ltd.

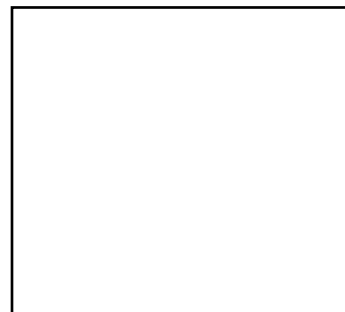
2100 Derry Road West, Suite 400
Mississauga, Ontario
L5N 0B3

Tel: 905-858-4424

Contact: Joel Linde

Tel: 905-369-1037

Email: Joel.linde@stantec.com



.4 Mechanical Engineer:

Chorley + Bisset Consulting Engineers

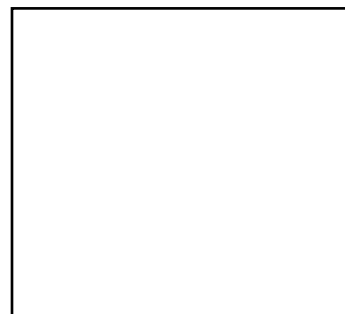
201 Queens Avenue, Unit 800
London, Ontario
N6A 1J1

Tel: 519-679-8660

Contact: Derek Vakaras

Tel: 416-598-5181

Email: derek.vakaras@chorley.com



Project Directory and Seals

.5 Electrical Engineer:

Chorley + Bisset Consulting Engineers

201 Queens Avenue, Unit 800
London, Ontario
N6A 1J1

Tel: 519-679-8660

Contact: Michael Myatt

Tel: 416-598-5181

Email: michael.myatt@chorley.com



.6 Landscape Architect:

Stantec Consulting Ltd.

401 Wellington Street West, Suite 100
Toronto, Ontario
M5V 1E7

Tel: 416-596-6686

Contact: Jim Vafiades

Tel: 416-598-6695

Email: Jim.Vafiades@stantec.com



.7 Civil Engineer:

Stantec Consulting Ltd.

100-300 Hagey Boulevard
Waterloo, Ontario
N2L 0A4

Tel: 519-579-4410

Contact: Trevor Fraser

Tel: 226-898-2479

Email: trevor.fraser@stantec.com



.8 Architectural Hardware Consultant:

Spyder SC

26 Dale Crescent
Bradford West Gwillimbury, Ontario
L0L 1L0

Contact: Cameron Gibson, President

Tel: 647-271-6489

Email: cameron.gibson@spydersc.com

Project Directory and Seals

.9 Wayfinding Consultant:

Artellix Inc.
222 Hamilton St.
Toronto, Ontario
M4M 2E2

.10 Code Consultant:

LRI Engineering Inc.
170 University Avenue, 3rd Floor - Box
Toronto, Ontario
M5H 3B3

Tel: 416-515-9331

Contact: Lisa Miller-Way
Tel: 416-515-9331 ext. 345
Email: lmillers-way@lrifire.com

.11 Planning Consultant

Stantec Consulting Ltd.
100-300 Hagey Boulevard
Waterloo, Ontario
N2L 0A4

Tel: 519-579-4410

Contact: Moira Davidson
Tel: 298-244-8222
Email: moira.davidson@stantec.com

.12 Architectural Specification Consultant

Brian Ballantyne Specification
1289-A Cornwall Road
Oakville, Ontario
L6J 7W5

Tel: 905-825-3359

Contact: Brian Ballantyne
Tel: 905-825-3359 ext. 227
Email: bballantyne@bbspecs.com

END OF SECTION

Table of Contents

DR - indicates entity responsible for preparation of listed documents (see Section 00 01 05)

<u>Document Identification</u>	<u>DR</u>	<u>Pgs</u>	<u>Issued</u>
<u>VOLUME 1</u>			
INTRODUCTORY INFORMATION			
00 01 05 Project Directory and Seals.....	O	4	2024-06-07
00 01 10 Table of Contents	A	6	2024-06-07
00 11 10 Prequalified Bidders.....	A	1	2024-06-07
00 21 13 Instructions to Bidders	A	11	2024-06-07
00 31 00 Information Available for Review.....	O	1	2024-06-07
00 41 13 Stipulated Price Bid Form	A	5	2024-06-07
00 73 00 Supplementary Conditions to CCDC 2 – 2020	O	33	2024-06-07
DIVISION 01 - GENERAL REQUIREMENTS			
01 11 00 Summary of Work	A	7	2024-06-07
01 21 00 Allowances	A	2	2024-06-07
01 25 00 Substitution Procedures.....	A	3	2024-06-07
01 26 00 Contract Modification Procedures	A	4	2024-06-07
01 29 00 Payment Procedures	A	2	2024-06-07
01 31 00 Project Management and Coordination	A	5	2024-06-07
01 31 01 RFI Form	A	1	2024-06-07
01 31 14 Mechanical and Electrical Coordination	A	3	2024-06-07
01 31 19 Project Meetings	A	7	2024-06-07
01 32 00 Construction Progress Documentation.....	A	6	2024-06-07
01 33 00 Submittal Procedures.....	A	9	2024-06-07
01 35 13 Healthcare Facility Procedures	A	11	2024-06-07
01 42 13 Acronyms and Abbreviations	A	17	2024-06-07
01 45 00 Quality Requirements	A	8	2024-06-07
01 50 00 Temporary Facilities & Controls	A	9	2024-06-07
01 56 23 Hoarding.....	A	2	2024-06-07
01 60 00 Product Requirements	A	4	2024-06-07
01 71 00 Examination and Preparation.....	A	2	2024-06-07
01 73 00 Execution.....	A	6	2024-06-07
01 73 29 Cutting and Patching.....	A	3	2024-06-07
01 74 00 Cleaning and Waste Management.....	A	4	2024-06-07
01 77 00 Closeout Procedures	A	4	2024-06-07
01 78 00 Closeout Submittals.....	A	6	2024-06-07
01 78 36 Warranties	A	1	2024-06-07
01 79 00 Demonstration and Training.....	A	2	2024-06-07
01 91 26 Integrated Fire Protection and Life Safety Systems Testing	A	3	2024-06-07

Table of Contents

DR - indicates entity responsible for preparation of listed documents (see Section 00 01 05)

<u>Document Identification</u>	<u>DR</u>	<u>Pgs</u>	<u>Issued</u>
DIVISION 02 - EXISTING CONDITIONS			
02 41 16 Demolition.....	A	7	2024-06-07
DIVISION 03 - CONCRETE			
03 10 00 Concrete Formwork	S	23	2024-06-07
03 15 00 Concrete Accessories	S	19	2024-06-07
03 20 00 Concrete Reinforcement	S	14	2024-06-07
03 30 00 Cast-in-Place Concrete	S	36	2024-06-07
03 35 00 Concrete Floor Finishing.....	A	4	2024-06-07
03 48 00 Architectural Precast Concrete Fabrications	A	4	2024-06-07
DIVISION 04 - MASONRY			
04 05 00 Masonry Procedure.....	A	9	2024-06-07
04 05 13 Masonry and Grout for Masonry.....	A	3	2024-06-07
04 05 19 Masonry Reinforcement and Connectors	A	3	2024-06-07
04 05 23 Masonry Accessories.....	A	4	2024-06-07
04 21 00 Brick Masonry Unit.....	A	1	2024-06-07
04 22 00 Concrete Masonry Unit	A	2	2024-06-07
DIVISION 05 - METALS			
05 12 00 Structural Steel	S	15	2024-06-07
05 31 00 Steel Roof Deck.....	S	11	2024-06-07
05 32 00 Steel Floor Deck	S	9	2024-06-07
05 41 13 Lateral Load-Bearing Cold-Formed Metal Framing	A	5	2024-06-07
05 50 00 Metal Fabrications	A	9	2024-06-07
05 50 10 Architectural Metal Fabrications	A	10	2024-06-07
05 52 16 Modular Workplace Guardrail System.....	C	7	2024.05.27
DIVISION 06 - WOOD, PLASTIC, AND COMPOSITES			
06 10 53 Rough Carpentry	A	4	2024-06-07
06 40 00 Architectural Woodwork	A	11	2024-06-07
DIVISION 07 - THERMAL AND MOISTURE PROTECTION			
07 13 26 Self-Adhering Sheet Waterproofing.....	A	4	2024-06-07
07 21 00 Thermal Insulation	A	5	2024-06-07
07 21 29 Sprayed-Applied Foamed-in-Place Insulation	A	5	2024-06-07
07 26 16 Below-Grade Vapour Barrier.....	A	3	2024-06-07
07 27 00 Air Barrier Systems.....	A	5	2024-06-07
07 42 63 Ceramic Cladding System.....	A	13	2024-06-07
07 46 16 Aluminum Panel Cladding System	A	10	2024-06-07
07 46 19 Metal Cladding Systems	A	7	2024-06-07
07 52 16 Styrene-Butadiene-Styrene (SBS) Modified			

Table of Contents

DR - indicates entity responsible for preparation of listed documents (see Section 00 01 05)

<u>Document Identification</u>	<u>DR</u>	<u>Pgs</u>	<u>Issued</u>
Bituminous Membrane Roofing	A	15	2024-06-07
07 62 00 Metal Flashing	A	7	2024-06-07
07 72 00 Roof Accessories	A	2	2024-06-07
07 81 00 Sprayed Fire-Resistive Materials (SFRM)	A	3	2024-06-07
07 84 00 Joint Firestopping and Smoke Seals	A	7	2024-06-07
07 92 00 Joint Sealants	A	11	2024-06-07
07 95 00 Expansion Joint Cover Assemblies	A	5	2024-06-07
DIVISION 08 - OPENINGS			
08 11 13 Steel Doors and Frames	A	12	2024-06-07
08 32 13 Interior Aluminum Sliding Doors	A	5	2024-06-07
08 33 23 Ambulance Garage Vehicle Doors	A	7	2024-06-07
08 42 26 Glass Partitions and Screens	A	6	2024-06-07
08 42 29 Automatic Sliding Entrance Doors	A	6	2024-06-07
08 44 00 Aluminum Framed Glazing Systems	A	17	2024-06-07
08 44 15 Fire Rated Exterior Window System	A	9	2024-06-07
08 71 00 Finish Hardware	A	5	2024-06-07
Door Hardware	H	89	2024-04.16
08 80 00 Glass and Glazing	A	14	2024-06-07
08 88 61 Vision Control Glazing	A	6	2024-06-07
DIVISION 09 - FINISHES			
09 22 00 Metal Supports for Gypsum and Cement Board	A	10	2024-06-07
09 29 00 Gypsum Board	A	15	2024-06-07
09 31 00 Tiling	A	14	2024-06-07
09 51 23 Acoustical Tile Ceiling Systems	A	8	2024-06-07
09 54 23 Linear Metal Panels	A	7	2024-06-07
09 65 13 Resilient Base and Accessories	A	5	2024-06-07
09 65 15 Rubber Sheet Flooring	A	11	2024-06-07
09 65 36 Static Control Resilient Flooring	A	10	2024-06-07
09 67 00 Fluid-Applied Flooring	A	9	2024-06-07
09 69 13 Raised Flooring	A	7	2024-06-07
09 78 00 Interior Wall Paneling	A	7	2024-06-07
09 91 00 Painting	A	11	2024-06-07
DIVISION 10 - SPECIALTIES			
10 14 00 Wayfinding Signage	W	11	2024-06-07
10 21 13 Phenolic Toilet Partitions	A	4	2024-06-07
10 26 13 Corner Guards and Wall Protection	A	5	2024-06-07
10 28 00 Washroom and Miscellaneous Accessories	A	8	2024-06-07
10 51 13 Prefinished Metal Lockers	A	2	2024-06-07
10 51 26 Solid Phenolic Lockers	A	2	2024-06-07

Table of Contents

DR - indicates entity responsible for preparation of listed documents (see Section 00 01 05)

<u>Document Identification</u>	<u>DR</u>	<u>Pgs</u>	<u>Issued</u>
10 73 43 Wheelchair Shelter.....	A	2	2024-06-07
DIVISION 11 - EQUIPMENT			
11 72 13 Medical Headwalls	A	8	2024-06-07
DIVISION 31 - EARTHWORK			
31 05 16 Aggregates: General.....	C	4	2024.05.27
31 12 13 Site Clearing	C	4	2024.05.27
31 12 14 Removal of Existing Asphalt Pavement.....	C	2	2024.05.27
31 12 15 Sitework Demolition and Removal	C	6	2024.05.27
31 22 19 Site Earthwork	C	4	2024.05.27
31 23 00 Excavation and Backfill	A	4	2024-06-07
31 23 16 Excavation, Trenching & Backfilling	C	6	2024.05.27
31 23 17 Rock Removal	C	3	2024.05.27
31 23 24 Roadway Excavation, Embankment and Compaction ...	C	5	2024.05.27
31 25 05 Erosion and Sedimentation Control.....	C	9	2024.05.27
31 63 33 Micropiles	S	19	2024-06-07
DIVISION 32 – EXTERIOR IMPROVEMENTS			
32 11 23 Granular Base.....	C	4	2024.05.27
32 11 24 Granular Sub-Base	C	3	2024.05.27
32 12 16 Asphalt Paving.....	C	8	2024.05.27
32 12 17 Roadways.....	C	5	2024.05.27
32 14 13 Unit Paving	L	7	2024-06-07
32 16 15 Concrete Sidewalks, Curbs and Gutters	C	5	2024.05.27
32 17 24 Painted Pavement Markings	C	3	2024.05.27
32 17 26 Tactile Warning Surfacing.....	A	3	2024-06-07
32 33 00 Site Furnishings.....	A	2	2024-06-07
32 37 00 Exterior Site Furnishings.....	L	1	2024-06-07
32 91 19.1 Topsoil and Finish Grading-Landscape.....	L	5	2024-06-07
32 92 23 Sodding	L	3	2024-06-07
32 93 10 Trees, Shrubs, and Groundcovers	L	10	2024-06-07
DIVISION 33 - UTILITIES			
33 05 13 Manholes and Catchbasins.....	C	5	2024.05.27
33 11 16 Watermains	C	20	2024.05.27
33 31 13 Site Sanitary Sewerage Piping.....	C	9	2024.05.27
33 41 13 Foundation Drainage	A	3	2024-06-07
33 44 00 Storm Sewers	C	13	2024.05.27

Table of Contents

DR - indicates entity responsible for preparation of listed documents (see Section 00 01 05)

<u>Document Identification</u>	<u>DR</u>	<u>Pgs</u>	<u>Issued</u>
<u>VOLUME 2</u>			
INTRODUCTORY INFORMATION			
00 01 05 Project Directory and Seals.....	O	4	2024-06-07
00 01 10 Table of Contents	A	6	2024-06-07
DIVISION 21, 22, 23 AND 25 - MECHANICAL			
21 05 01 Common Work Results for Mechanical	M	28	2024-06-07
21 12 00 Fire Protection	M	8	2024-06-07
22 07 00 Plumbing Insulation.....	M	5	2024-06-07
22 10 00 Plumbing Piping and Pumps	M	13	2024-06-07
22 40 00 Plumbing Fixtures	M	9	2024-06-07
22 60 00 Medical Gases	M	8	2024-06-07
23 05 48 Noise Control and Vibration Isolation	M	5	2024-06-07
23 05 93 Testing, Adjusting and Balancing for HVAC	M	10	2024-06-07
23 07 00 HVAC Insulation	M	9	2024-06-07
23 20 00 HVAC Piping and Pumps	M	15	2024-06-07
23 25 00 HVAC Water Treatment	M	4	2024-06-07
23 30 00 HVAC Air Distribution.....	M	14	2024-06-07
23 30 10 Duct Cleaning	M	5	2024-06-07
23 70 00 Central HVAC Equipment	M	3	2024-06-07
23 80 00 Decentralized HVAC Equipment	M	14	2024-06-07
25 00 00 Controls	M	33	2024-06-07
DIVISION 26, 27 AND 28 - ELECTRICAL			
26 05 00 Common Work Results for Electrical.....	E	23	2024-06-07
26 05 33 Basic Material and Methods.....	E	10	2024-06-07
26 08 00 Commissioning and Field Quality Control	E	12	2024-06-07
26 09 23 Lighting Control Systems	E	8	2024-06-07
26 20 00 Low Voltage Electrical Distribution	E	4	2024-06-07
26 27 90 Patient Care Areas – Wiring Methods	E	2	2024-06-07
26 29 00 Motors, Starters and Wiring	E	4	2024-06-07
26 29 23 Variable Frequency Motor Controllers.....	E	7	2024-06-07
26 50 00 Lighting.....	E	6	2024-06-07
26 80 10 Heating Cables	E	3	2024-06-07
27 05 28 Pathways for Communications Systems	E	4	2024-06-07
27 10 00 Structured Cabling	E	11	2024-06-07
27 51 13 Paging System.....	E	2	2024-06-07
27 52 23 Nurse Call Code Blue Systems	E	13	2024-06-07
27 53 13 Clock System.....	E	3	2024-06-07
28 10 00 Electronic Access Control and CCTV.....	E	4	2024-06-07
28 31 00 Fire Detection and Alarm	E	10	2024-06-07

Table of Contents

DR - indicates entity responsible for preparation of listed documents (see Section 00 01 05)

<u>Document Identification</u>	<u>DR</u>	<u>Pgs</u>	<u>Issued</u>
28 31 00 Appendix – Integrated System Testing of Fire Protection Systems.....	E	20	May 24

END OF SECTION

Instructions to Bidders

PART 1 - GENERAL

1.1 General

- .1 Name of *Owner*: Guelph General Hospital.
- .2 *Bidder*: is defined as the company submitting a bid to the *Owner* in response to the *Owner's* invitation to bid.

1.2 The *Bid Documents*

- .1 The *Bid Documents* shall be defined as comprising the following documents:
 - .1 Section 00 21 13 Instructions to *Bidders*.
 - .2 Section 00 31 00 Information Available for Review.
 - .3 Section 00 41 13 Stipulated Price Bid Form.
 - .4 Addenda issued prior to *Bid Closing Time*.
 - .5 Agreement between *Owner* and *Contractor* in the form of CCDC 2 - 2020.
 - .6 Definitions given in CCDC 2 - 2020.
 - .7 General Conditions of CCDC 2 - 2020.
 - .8 Supplementary Conditions to CCDC 2 - 2020.
 - .9 Specifications as listed in Section 00 01 10 of the project manual for this project.
 - .10 Schedules as listed in Section 00 01 10 of the project manual and as listed in the list of drawings.
 - .11 Drawings as listed in the list of drawings given on Drawings Title Page.

1.3 The *Contract Documents*

- .1 The *Contract Documents* shall be defined as comprising the following documents:
 - .1 Addenda.
 - .2 Agreement between *Owner* and *Contractor* in the form of CCDC 2 - 2020.
 - .3 Definitions given in CCDC 2 - 2020.
 - .4 General Conditions of CCDC 2 - 2020.
 - .5 Supplementary Conditions to CCDC 2 - 2020.
 - .6 Specifications as listed in Section 00 01 10 of the project manual for this project.
 - .7 Schedules as listed in Section 00 01 10 of the project manual and as listed in the list of drawings.
 - .8 Drawings as listed in the list of drawings given on Drawings Title Page.

Instructions to Bidders

1.4 Electronic Bid Submission

- .1 Electronic Submission Protocol:
 - .1 Submit one (1) electronic copy of Bid via Bonfire.
 - .2 Bids sent by any other electronic or physical means shall not be considered.
 - .3 Directions for electronic Bid Submission are included with the invitation to Bid; follow instructions on the Portal.
- .2 *Bid Closing Time*:
 - .1 The *Bid Closing Time* is defined as the time and date before which bids shall be received by the *Owner*, namely:
 - .1 Before 2:00 pm local time, as determined by the clock located in location for receiving bids on July 11, 2024.
 - .2 Any bid received at 2:00 pm local time on July 11, 2024 will be declared a bid received after the *Bid Closing Time*.
 - .3 Any bid received after 2:00 pm local time on July 11, 2024 will be declared a bid received after the *Bid Closing Time*.
- .3 It is Bidders responsibility to ensure that the *Owner* received their electronically transmitted Bid before *Bid Closing Time*.

1.5 Bid Opening Meeting

- .1 A bid opening meeting will be held following the stage 1 evaluation.
- .2 Bid opening meeting will be virtual. Bidders must provide email address to send bid opening meeting invite. Meeting invite will be sent to email address provided in bid form.
- .3 Virtual bid opening meeting invite will only be sent to bidders who have met the mandatory requirements and met or exceeded the minimum prescribed technical score.
- .4 The names of the *Bidders*, the bid prices and confirmation of receipt of required bid securities will be announced. Bid opening information will be recorded and distributed to *Bidders* not in attendance.

1.6 Bid Submission Requirements

- .1 Bids must be received by the *Owner* before the *Bid Closing Time*.
- .2 Bids must be submitted on Section 00 41 13. Fill-in blanks on such documents and forms.
- .3 The *Bidder* shall present the bid price in figures.
 - .1 The stipulated bid price shall include the cost of all *Products*, materials, labour, equipment, delivery, storage, handling, statutory charges, overhead and profit, other related charges, and inclusive of all duties and taxes applicable, except *Value Added Taxes*, and all other charges on account of such work, measured complete in place for all parts of the *Work*.

Instructions to Bidders

- .4 Documents and forms submitted must be legible, written in ink or typewritten, and all items must be bid. Any form of erasure, strikeout, or overwriting must be initialled by the *Bidder's* authorized signing officer.
- .5 Bids submitted must be signed and sealed. Incorporated companies shall affix their corporate seal and have bid signed by their duly authorized officers.
- .6 Bids must not be restricted by a covering letter, a statement added, or by alterations not called for.
- .7 Each bid shall include a completed Section 00 41 13, as required, a bid bond, and an agreement to bond, as required herein, together with any bid form supplements that *Bidder* is instructed elsewhere herein, or in any addendum hereto, to submit with its bid.
- .8 In no event will the *Owner* be responsible for any costs incurred by anyone in the preparation and/or submission of a bid.
- .9 By submitting a bid, a *Bidder* agrees to each and every of the terms, provisions and conditions set out in the *Bid Documents*.

1.7 Notification of Intent Not to Submit a Bid

- .1 Prospective Bidders who have received Bid Document, but do not intend to submit a Bid, are requested to notify *Consultant*, no later than 24 hours prior to *Bid Closing Time*.

1.8 Withdrawal of Bids Prior to *Bid Closing Time*

- .1 A *Bidder* who has submitted a bid may request that its bid be withdrawn.
 - .1 The withdrawal shall be allowed if request is made before the *Bid Closing Time*. Withdrawal requests must be directed to the *Bid* Coordinator by email, to the attention of:
 - .1 Lucy Wojcik at lwojcik@gghorg.ca.
 - .2 Authenticity of the withdrawal request must be confirmed by a responsible official of the *Bidder* who will be contacted at the time of bid withdrawal by the *Owner*.
 - .3 Where a bid withdrawal request is received and confirmed for a bid that has already been received by the *Owner*, the bid so withdrawn will be returned unopened to the *Bidder* after the bid opening, together with copies of the withdrawal request and confirmation. At the bid opening, such bids shall be announced as withdrawn and shall not be opened.

1.9 Bidder Inquiries and Issuance of Addenda

- .1 *Bidder* Inquiries are to be submitted via Bonfire.
- .2 The *Owner* and *Consultant* will be responsible for clarifications of *Bid Documents* only as incorporated into addenda as issued to holders of *Bid Documents* on record at the offices of the *Owner*.

Instructions to Bidders

- .3 Questions received later than 5:00 pm, local time, on July 2, 2024 may not be answered by addenda.
- .4 Addenda will be issued no later than 5:00 pm, local time, on July 4, 2024.
- .5 *Bidders* shall notify *Consultant*, in writing prior to *Bid Closing Time*, of the following:
 - .1 Discrepancies or omissions found in the *Bid Documents*.
 - .2 Clarifications required regarding the meaning of requirements contained in the *Bid Documents*.
- .6 The *Consultant* may issue written addenda to registered holders of the *Bid Documents*.
- .7 Where apparent discrepancies are identified by *Bidders* among the various parts of the *Bid Documents*, and in the absence of addenda addressing such apparent discrepancies, *Bidders* shall allow for the greater amount of labour required and/or materials referred to, including increased bonding and insurance requirements, as applicable, when preparing their bid.

1.10 Bonding Requirements

- .1 Bonds shall be issued by a bonding company acceptable to *Owner* and licensed to issue such instruments in the Province of Ontario.
- .2 Bid Bond:
 - .1 Each *Bidder* shall submit with its bid a bid bond, in the form of CCDC 220 in an amount equal to not less than 10% of the bid price, and naming the *Owner* as the Obligee.
 - .2 The bid bond shall be valid for *Bid Acceptance Period*.
 - .3 The bid bonds, with the exception of those of the *Bidders* submitting the two most appropriate bids, in the *Owner's* absolute discretion, will be returned within 10 *Working Days* after the *Bid Closing Time*.
 - .4 The bid bonds of the *Bidders* submitting, in the *Owner's* sole and absolute discretion, the two most appropriate bids will be returned when the *Bidder* to whom the *Owner* has issued the notification of conditional award of the *Contract* described later in this section, has fully complied with the conditions pertaining to *Contract* award described in the *Bid Documents* and the notification of conditional award of the *Contract*. If the *Bidder* so notified refuses or neglects to comply with the said conditions, the *Owner* may, at its sole discretion, claim against the bid bond, and the bid bond shall be subject to forfeiture, not as penalty, but as liquidated damages sustained. The *Owner* shall then have the right to award the *Contract* to the *Bidder* submitting, in the *Owner's* sole and absolute discretion, the next most appropriate bid, or to re-offer the invitation to submit bids.
- .3 Agreement to Bond:

Instructions to Bidders

- .1 Each *Bidder* shall submit with its bid an agreement to bond issued by a bonding company acceptable to *Owner* and licensed to issue such instruments in the Province of Ontario, obliging bonding company to issue a performance bond and a labour and material payment bond, each naming the *Owner* as the Obligee, in the amounts and in the forms as follows:
 - .1 Performance bond:
 - .1 Amount: 50% of the bid price.
 - .2 Form: CCDC 221 Performance Bond.
 - .2 Labour and material payment bond:
 - .1 Amount: 50% of the bid price.
 - .2 Form: CCDC 222 Labour and Material Payment Bond.
- .2 The agreement to bond shall be valid for *Bid Acceptance Period*.
- .4 Costs for bonds are included in the stipulated price bid.

1.11 The *Bid Acceptance Period*

- .1 The *Bid Acceptance Period* is defined as a period of up to, and including, 90 days, commencing at the *Bid Closing Time*, during which bids shall be irrevocable and open to acceptance by *Owner*.

1.12 Mandatory Pre-Bid Meeting

- .1 *Bidders* are required to attend a meeting for holders of *Bid Documents* on record at 12 pm on June 18, 2024, at the *Place of the Work*. *Bidder* attendance at this meeting is mandatory.
- .2 *Bidder's* representatives attending the pre-bid meeting shall include the *Bidder's* project manager and estimator. *Bidder's* may also invite their mechanical and electrical subcontractors.
- .3 Bids submitted by *Bidders* not attending this mandatory meeting may be declared non-compliant and rejected.

1.13 *Bid Documents* Availability

- .1 *Bidders (Contractor)* will be supplied with an electronic copy of *Bid Documents*, at no charge. *Bid Documents* will be available online through Bonfire.
- .2 *Bid Documents* have also been placed on display for benefit of *Suppliers* and *Subcontractors* at the following offices:
 - .1 Grand Valley Construction Association.
 - .2 Hamilton-Halton Construction Association.
 - .3 London & District Construction Association.
 - .4 Niagara Construction Association.

Instructions to Bidders

- .5 Toronto Construction Association.

1.14 Completion Time

- .1 *Bidders* shall state the completion time in the space provided in Section 00 41 13. The completion time shall be stated as the number of weeks within which the *Bidder* proposes to complete the *Work* from notification of conditional award of the *Contract* to the *Bidder* by the *Owner*. The completion time stated by the *Bidder* shall form the basis of the *Contract Time*.
- .1 The time stated by the *Bidder* will not be considered by the *Owner* in determining the most appropriate *Bidder*.

1.15 Examination of the *Bid Documents* and the *Place of the Work*

- .1 It is the responsibility of the *Bidder* to examine the *Bid Documents* carefully and immediately upon receipt to verify that the set of *Bid Documents* that has been received by the *Bidder* is complete in all respects. Any omissions shall be brought to the attention of the *Consultant* following the procedures prescribed in this section (above) for *Bidder* inquiries.
- .1 No payments for extra work will be allowed where such extra work is the result of the *Bidder* using an incomplete set of *Bid Documents* in the preparation of their *Bid*.
- .2 *Bidders* shall examine the complete *Bid Documents* and shall also visit the *Place of the Work* and carefully examine conditions affecting the *Place of the Work* and work to be done thereon.
- .3 It is the responsibility of the *Bidder* to make an estimate of the difficulties to be encountered in performing the *Work*. If investigative work is carried out at the *Place of the Work* by *Bidders*, *Bidders* undertaking such investigative work shall make good the *Place of the Work* to the condition that it was in before the investigation was made. The *Bidder* shall be responsible for damage and claims resulting from that investigation.
- .4 The levels and other information provided in the *Bid Documents* are furnished in good faith for the use and guidance of the *Bidder* in the preparation of their bid, but shall in no way relieve the *Bidder* of the responsibility of ascertaining to their own satisfaction the nature of conditions existing at the *Place of the Work*.
- .5 No payments for extra work will be allowed for conditions known, knowable, or reasonably inferable from a thorough examination of the *Bid Documents* or the *Place of the Work* prior to the *Bid Closing Time*.

1.16 Availability of *Products*

- .1 *Products* that are specified by their proprietary names or by part or catalogue number form the basis of the *Contract*. No substitutes for such *Products* may be used without *Consultant's* prior acceptance in writing.

Instructions to Bidders

- .2 Prior to submitting bid, *Bidders* shall review *Product* delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of *Products* are likely or possible, notify *Consultant* of such, in order that substitutions or other remedial action may be contemplated.
- .3 In the event of failure to notify the *Consultant* prior to submitting bid of potential delays in supply of *Products*, and should it subsequently appear that the *Work* may be delayed for such reason, the *Consultant* reserves the right to substitute more readily available *Products* of similar character, at the *Contractor's* cost and at no additional cost to the *Owner*

1.17 *Bidder's Proposed Alternatives*

- .1 Submit bids for work only as indicated in the *Bid Documents*. Unsolicited alternatives may be proposed by *Bidder* during bid period. Submit *Bidder* proposed alternatives at least 10 *Working Days* prior to the *Bid Closing Time* to allow for review, and for incorporation into an addendum, if accepted.
- .2 *Bidder* proposed alternatives submission requirements:
 - .1 Description of *Bidder* proposed alternatives, including detailed comparative specification of *Bidder* proposed alternatives with the specified *Product*.
 - .2 Manufacturer's *Product* data sheets for proposed *Products*.
- .3 The *Owner* is under no obligation either to review or to accept *Bidder* proposed alternatives.

1.18 *Contractor's Qualification Statement – CCDC 11*

- .1 As part of the *Bid* submission, submit proof, in the form of CCDC 11 - Contractor's Qualification Statement, of qualifications of *Contractor* to verify *Contractor's* qualifications and experience meet or exceed the requirements of the *Contract Documents*.

1.19 *Award of Contract*

- .1 Bid evaluation:
 - .1 The evaluation process will be conducted by the Evaluation Team, which may obtain the assistance of consultants and advisors as it may deem appropriate. However, and notwithstanding anything else contained in the *Bid Documents*, the award of the *Contract*, if any, may be subject to the approval of the *Owner* in its sole and unfettered discretion.
 - .2 Bidders shall have no claims whatsoever against the *Owner* or any member of the Evaluation Team or the *Consultant* arising out of the *Owner's* exercise of its authority, and/or in the event the *Owner*, in its sole and unfettered discretion, and for any or no reason, decides not to award the *Contract*.
 - .3 Without limiting any of the other provisions of the *Bid Documents*, Bids will be evaluated and the successful Bidder will be selected based on a 3 stage evaluation:

Instructions to Bidders

- .1 STAGE 0: Bids will first be evaluated based on the Mandatory Requirements;
 - .2 STAGE 1: Bids will then be evaluated using the point-based evaluation method described below under Evaluation Criteria (STAGE 1). Only Bids which comply with all of the Mandatory Requirements will be evaluated using the points rated evaluation criteria and considered for an award of the *Contract*;
 - .3 STAGE 2: In the second instance, the Evaluation Team will select a subset of Bidders with the highest ranking Evaluation Scores under Evaluation Criteria (STAGE 1) for an assessment of their proposed Bid Prices.
 - .4 Subject to the other provisions of the *Bid Documents*, the successful Bidder will be the Bidder which submits the Bid with the best combination of Evaluation Score and Bid Price as determined by the Evaluation Team.
- .4 Mandatory Requirements:
- .1 Only Bidders which submit Bids which the Evaluation Team determines meet all of the mandatory requirements set out below on a “pass/fail” basis will be eligible to be considered for an award of the *Contract*. Mandatory requirements are as follows:
 - .1 The Bid includes the Base Bid Form, and any Supplementary Bid Forms.
 - .2 The Bid was submitted before bid closing time.
 - .3 Submit contact information including company name, address, phone number, and email address.
 - .4 The Bid includes a filled CCDC 11, 2019 form bearing the Bidder’s original signature as well as the appropriate CCDC seals.
 - .5 The Bid includes the Bidder’s most recent CAD 7 Calculations or Merit Adjustment Plan statements (whichever applies) issued by WSIB.
 - .6 The Bid includes the Bidder’s most recent certification in infection prevention and control as provided by CSA in the following courses: “Fundamentals of Infection Control During Construction, Renovation and Maintenance of Healthcare Facilities” AND “Effective Implementation and Practical Applications of Infection Control During Construction, Renovation and Maintenance of Health Care Facilities”
 - .7 The Bid includes a preliminary schedule outlining the Bidders proposed timeframe and strategy for performing the work.
 - .8 Where a mandatory site meeting was scheduled and held, the Bidder attended the mandatory site meeting, as verified by the Site Meeting Log.
 - .9 The Bid includes the Bid Performance and Security.
 - .10 The Bid does not contain any exceptions, revisions, conditions or other qualifications.
 - .11 The Bid substantially complies with the other requirements of the Bid Documents.

Instructions to Bidders

.12 The sub-contractor list for Civil, Mechanical, and Electrical has been provided.

.5 Evaluation Criteria (STAGE 1):

- .1 Only Bids which meet all of the above mandatory requirements will be evaluated by the Evaluation Team and awarded points based on criteria set out below:

CRITERIA	POINTS AVAILABLE
Profile and experience of bidder and evaluation from the CCDC 11, Appendices and Supplementary documentation.	40
Bidder Personnel proposed for the Work including subcontractors list in the Stipulated Price Bid Form. .	30
Financial capacity of Bidders as evaluated from the CCDC 11 form and appendix.	20
References	10
Maximum points available	100

- .2 As few as zero (0) points will be awarded for each evaluation category; the maximum points available for each evaluation category are set out above.

- .3 The total points awarded to a Bidder will be that Bidder's "Evaluation Score".

.6 Evaluation Criteria (STAGE 2):

- .1 Bid form and Bid form supplements will be opened during bid opening upon completion of stage 1 requirements. Bids must contain the Base Bid Form, and any Supplementary Bid Forms, bearing the Bidder's original signature.
- .2 Only Bids which have been selected under the STAGE 1 evaluation will be evaluated in STAGE 2 by the Evaluation Team and awarded points based on criteria set out below:

CRITERIA	POINTS AVAILABLE
Bid price offered/Bid price as adjusted by the amount of any itemized, alternative prices(s) which the Owner, in its discretion, decides to accept.	90
Building Ontario Business Initiative (BOBI) evaluation.	10
Maximum points available	100

- .3 Building Ontario Business Initiative (BOBI) will be considered when evaluating Bidders.

Instructions to Bidders

- .7 The *Owner*, in its discretion, may:
 - .1 Only Bids which meet all of the above mandatory requirements will be evaluated by the Evaluation Team and awarded points based on criteria set out below:
 - .2 evaluate one or more of the Bids using the points-based evaluation criteria set out in herein above without regard to the Mandatory Requirements, and may award a *Contract* for the whole or any part of The *Work* to the Bidder which submitted the Bid with the highest Evaluation Score; and/or
 - .3 negotiate a *Contract* for the whole or any part of The *Work* with any Bidder; and/or
 - .4 take any action in accordance with *Owner's* Rights as noted herein.
 - .5 Evaluation Method:
 - .1 The lowest compliant Bid with minimum 70 points on the technical submission and meeting mandatory requirements shall be selected.
- .2 *Contract Award*:
 - .1 Delivery by registered mail or common carrier, to the address given by the *Bidder* in its bid on Section 00 41 13, of notification of conditional award of the *Contract* to the *Bidder* by the *Owner* shall constitute acceptance of said bid and notice of award of the *Contract* by the *Owner* to the *Bidder* to the extent described by the notice of conditional award.
 - .2 It is intended that a *Contract* will be awarded within the *Bid Acceptance Period*. *Contract Documents* will be prepared by *Contractor* including the *Owner's* Supplement Requirements immediately following *Contract* award and are to be signed within 4 weeks of *Contract* award. *Contractor's* organization and mobilization at the *Place of the Work* may be permitted prior to signing of *Contract*.
 - .3 If *Bidder* has not been so notified within the *Bid Acceptance Period*, the *Bidder* may, unless *Bidder* has otherwise agreed or offered and except as otherwise provided herein, withdraw its bid without penalty, forfeiture, or obligation to the *Owner* or any kind.
 - .4 The *Bidder* accepts and agrees that, upon receipt of the notice of conditional award of *Contract*, the *Bidder* will comply with the conditions stipulated by the notice of conditional award of *Contract*.
 - .5 The *Bidder* accepts and agrees that, upon fulfillment to the satisfaction of the *Owner* of the above noted requirements, and any other conditions described by the notice of conditional award, the *Owner* will provide written authorization to the *Bidder* to commence the *Work* and that, upon receipt of such authorization, the *Bidder* will, within 10 *Working Days*, commence the *Work* actively at the *Place of the Work*.
 - .6 The form of *Contract* shall be CCDC 2 - 2020, as amended by Supplementary Conditions to CCDC 2 - 2020.

Instructions to Bidders

1.20 Bonds and Insurance

- .1 The *Bidder* shall submit to the *Owner*, within 7 days from the date of receipt of notice of conditional award of *Contract*, the performance and labour and material payment bonds, each in amounts and in the forms described above.
- .2 The *Bidder* shall submit to the *Owner*, within 7 days from the date of receipt of notice of conditional award of *Contract*, proof that it has in place the various types of insurance as required by the *Contract*.
- .3 Submission of the performance and labour and material payment bonds and proofs of insurance shall be a condition of the award of the *Contract* to the extent described in the notice of conditional award of *Contract* referenced above.

END OF SECTION

Information Available for Review

1.1 Information Available for Review

- .1 The following documents are made available for review:
 - .1 Asbestos abatement report:
 - .1 "Guelph General Hospital 2023 Asbestos Audit Report", dated October 27, 2023, prepared by MTE Consultants.
 - .2 Geotechnical investigation report:
 - .1 "Geotechnical Investigation and Limited Chemical Testing Program Guelph General Hospital, Emergency Entrance Addition 73 Delhi Street Guelph, Ontario", dated January 24, 2024, prepared by Peto MacCallum Ltd.
 - .3 Owner's guidelines and policies:
 - .1 "Hospital-Wide Manual, Combine Policy and Procedure: Infection Prevention and Control during Construction, Renovation, and Maintenance", dated June 2017.
 - .4 Owner's furniture fixtures & equipment list.
- .2 The accuracy of the information contained in the above listed documents has not been independently verified by the *Consultant*.

END OF SECTION

Stipulated Price Bid Form

Project/Contract: Guelph General Hospital - Emergency Mental Health and Addictions Services (EMHAS) Relocation and Emergency Department (ED) Expansion

From (*Bidder*):

company name

street address or postal box number

city/town, province and postal code

To (*Owner*): Guelph General Hospital
115 Delhi Street
Guelph, Ontario, N1E 4J4

1.1 Bid Price

- .1 We, the undersigned, having examined the *Bid Documents* and addenda numbered _____ (inclusive), and having examined the *Place of the Work*, and examined conditions thereon that affect the *Work*; hereby accept and agree to enter into a *Contract* with the *Owner* to perform the *Work* required by the *Contract Documents* for the stipulated bid price of:

\$ _____ in Canadian dollars, excluding *Value Added Taxes*.
amount in figures

1.2 Declarations

- .1 We understand that the *Owner* will pay the *Value Added Taxes* payable with respect to the *Contract Price* and such is not included in the bid price.
- .2 We accept and agree to submit to the *Owner* required proofs of insurance specified in the conditions of the *Contract*, and as described in the *Bid Documents*, and to execute the *Contract* within 5 days from the date of notification of acceptance of this bid. We understand and agree that the submittal, by us, to the *Owner* of the proofs of insurance, within 7 days after receipt of notification of conditional award, will be a condition of the final award of the *Contract* to us by the *Owner*, to the extent permitted by any other conditions contained in the notice of conditional acceptance.
- .3 We undertake if our bid is accepted to commence the *Work* at the *Place of the Work*, actively, within 10 *Working Days* of the *Owner's* written authorization to commence the *Work*.
- .4 We declare that no person, firm or corporation other than the undersigned has any interest in this bid or in the proposed *Contract* for which this bid is made.

Stipulated Price Bid Form

- .5 We propose to attain *Substantial Performance of the Work* as certified by the *Consultant* within _____ weeks from notification of conditional award of the *Contract* to the bidder by the *Owner*.
- .6 We accept and agree that this bid is irrevocable and may not be withdrawn by the undersigned, subject to the conditions of the *Bid Documents* pertaining to the withdrawal of bids, and is open for acceptance by the *Owner* during the *Bid Acceptance Period*.
- .7 We have thoroughly examined the complete *Bid Documents*, and have visited the *Place of the Work* and carefully examined conditions affecting the *Place of the Work* and work to be done thereon, and have included in our bid price for all conditions that may affect the execution of the *Work* that are known, knowable, or reasonably inferable from such examinations, and agree and accept that no payments for extra work on account of such conditions will be allowed during the performance of the *Work*.
- .8 We attached hereto most recent certification in infection prevention and control as provided by CSA in the following courses: "Fundamentals of Infection Control During Construction, Renovation and Maintenance of Healthcare Facilities" AND "Effective Implementation and Practical Applications of Infection Control During Construction, Renovation and Maintenance of Health Care Facilities"
- .9 We attach hereto letter outlining compliance with Building Ontario Businesses Initiative (BOBI).
- .10 We attach hereto a completed CCDC 11 form.
- .11 We attach hereto a bid bond, in the form of Canadian standard construction document CCDC 220 in an amount equal to not less than 10% of our bid price. This bid bond is valid for the *Bid Acceptance Period*. The cost of this bid bond is included in our bid price.
- .12 We attach hereto an agreement to bond valid for the *Bid Acceptance Period* and issued by a bonding company acceptable to *Owner* and licensed to issue such instruments in the Province of Ontario. The costs of all bonds so required are included in our bid price. This agreement to bond obliges the bonding company to issue a performance bond and a labour and material payment bond, each in the amount of 50% of the bid price, in the forms as follows:
- .1 Performance bond: CCDC 221.
- .2 Labour and material payment bond: CCDC 222.
- .13 We propose to use the following *Subcontractors* in the execution of the *Work*:
- .1 Mechanical: _____
- .2 Electrical: _____
- .3 Civil: _____
- .14 We have included cash allowances as stipulated in the *Contract Documents*.

Stipulated Price Bid Form

- .15 We accept and agree that nothing contained in the *Bid Documents* or elsewhere, no act done or expense incurred by us in the preparation and submission of our bid, no trade or industry custom or practice, and no representation or assurance that may have been made or given to us by or on behalf of the *Owner*, shall in any manner legally bind the *Owner*, in any circumstances, to accept this bid.
- .16 We accept and agree that the *Owner* shall in no event be responsible for any costs incurred by us in the preparation and submission of our bid.

Stipulated Price Bid Form

1.3 Contact Information for Bid Opening Meeting

name and title of individual

Email Address

1.4 Signatures

Signed and submitted by:

company name

name and title of authorized signing officer

signature of authorized signing officer

name of witness

signature of witness

name and title of authorized signing officer

signature of authorized signing officer

name of witness

signature of witness

Dated this _____ day of _____, 20_____.

Stipulated Price Bid Form

Note: Affix corporate seal as required by *Bid Documents*.

END OF SECTION

GENERAL REFERENCE

The following Supplementary Conditions shall be read in conjunction with the Canadian Standard Construction Document, CCDC 2-2020. These Supplementary Conditions and Amendments shall modify, delete and/or add to the Agreement between the *Owner* and the *Contractor*, Definitions and General Conditions of the Stipulated Price Contract CCDC 2-2020. Section and paragraph references below are to the corresponding sections and paragraphs of the Agreement between *Owner* and *Contractor*, Definitions and General Conditions of the Stipulated Price Contract all forming part of Standard Construction Document, CCDC 2-2020, Stipulated Price Contract.

Where any article, paragraph or subparagraph in the Agreement, Definitions or General Conditions is supplemented by one of the following, the provisions of such article, paragraph or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph or subparagraph in the Agreement, Definitions or General Conditions is amended, deleted, voided, or superseded by any of the following, the provisions of such article, paragraph or subparagraph not so amended, voided, deleted, or superseded, shall remain in effect, and the numbering of the deleted item will be retained, unused.

The Stipulated Price Contract, CCDC 2-2020, is amended as follows:

AGREEMENT BETWEEN OWNER AND CONTRACTOR

ARTICLE A-1 THE WORK

Delete paragraph 1.3 and replace with the following:

“1.3 commence the *Work* by no later than thirty (30) calendar days after execution of the *Contract* and, subject to an adjustment in the *Contract Time* as provided for in the *Contract Documents*, attain *Ready-for-Takeover* by the *Scheduled Ready-to-Takeover Date*, and attain *Total Completion of the Work* by the *Scheduled Total Completion Date*.”

ARTICLE A-5 PAYMENT

Amend paragraph 5.1 by deleting “in accordance with legislation and statutory regulations respecting holdback percentages” and replacing with “a statutory holdback of ten percent (10%) as per the *Payment Legislation*”.

Delete paragraph 5.1.2 and replace with the following:

“5.1.2 upon *Substantial Performance of the Work*, as certified by the *Consultant*, and the conditions of GC 5.4.5 have been satisfied, and subject to GC 5.5 and any notice of non-payment of holdback, pay to the *Contractor* the unpaid balance of the holdback amount when due together with such *Value Added Taxes* as may be applicable to such, and”

Amend paragraph 5.2.1(1) by deleting the words “for the first 60 days”.

Delete paragraph 5.2.1(2) in its entirety and replace with “Intentionally deleted”.

ARTICLE A-7 LANGUAGE OF CONTRACT

Delete paragraph 7.1 in its entirety and replace with “Intentionally deleted”.

ARTICLE A-8 SUCCESSION

Amend paragraph 8.1 by inserting the word “permitted” before “assigns”.

ARTICLE A-9 GENERAL

Add new Article A-9 GENERAL as follows:

- “9.1 *Contractor* and *Owner* acknowledge and agree that one of the reasons why the *Contractor* was selected for the *Work* is the *Contractor’s* representation and warranty that it will attain *Ready-for-Takeover* and the *Total Completion of the Work* by the dates set out in Article A-1, paragraph 1.3, and the *Contractor* acknowledges that it has been advised by the *Owner* that it is critical to the *Owner* that *Ready-for-Takeover* be achieved by the prescribed date and that time is of the essence of this *Contract*.
- 9.2 Time is of essence of the *Contract*.
- 9.3 *Contractor* is an independent contractor in performing its obligations under the *Contract*. The *Contract* does not create any agency, partnership, joint venture, fiduciary or other relationship of the *Contractor* with the *Owner* other than the relationship of independent contractor. Nothing contained in the *Contract* shall create any employment or contractual relationship between *Owner* (or anyone acting on its behalf) and any *Contractor* personnel.
- 9.4 No approval or consent of, or certification, inspection, review, comment, verification, confirmation, acknowledgement, or audit by, any governmental authority, *Owner*, or the *Consultant*, or anyone on their behalf, shall relieve *Contractor* from performing or fulfilling any of its obligations under the *Contract*. Without limitation, whenever any drawings, plans, procedures, programs, or other work product of *Contractor* requires any review, inspection, comment or approval by any governmental authority, *Owner*, or the *Consultant*, or anyone on their behalf, any such review, inspection, comment, or approval shall not, in any way, reduce or modify any of *Contractor’s* obligations under the *Contract*.
- 9.5 If any part of the *Contract* or the application of such part to any party, person or circumstance shall, to any extent, be invalid or unenforceable, the remainder of the *Contract*, or the application of such part to any other party, person, or circumstance, shall not be affected thereby and each provision of the *Contract* shall be valid and enforceable to the fullest extent permitted by law.
- 9.6 This Agreement, including the *Contract Documents* described herein and the attachments, documents, and other agreements to be furnished or executed in connection herewith, supersede all prior negotiations, representations, or agreements, either written or oral, with respect to the subject matter hereof. No modification to the *Contract* shall be effective unless made in writing signed by both *Owner* and *Contractor*, unless otherwise provided for herein.

- 9.7 This *Contract* may be executed in any number of counterparts, and all such counterparts shall together constitute one instrument binding on the parties hereto, provided each party hereto has executed at least one counterpart, including any counterpart executed by a party hereto and transmitted to the other party hereto by facsimile transmission or by electronic mail with PDF attachment, and each shall be deemed to be an original, notwithstanding that all parties are not signatory to the same counterpart.”

DEFINITIONS

Add the following new definitions:

“Commissioning

Commissioning means the process of putting the *Work* or any part thereof into operation and includes Start-Up, Verification and Performance Testing as described in the *Contract Documents*.

Completion of Commissioning

Completion of Commissioning means the point in time at which the *Owner* and the *Consultant* are satisfied that the *Contractor* has successfully completed *Commissioning*.

Deficiency List

Deficiency List means the deficiency list prepared by the *Consultant* and/or *Owner*, acting reasonably, listing itemized deficiencies in the *Work*.

Governmental Authorities

Governmental Authorities means any government, legislature, municipality, regulatory authority, agency, commission, department, board, or other law regulation or rule making entity (including, without limitation, a minister of the Crown).

Hospital

Hospital means Guelph General Hospital.

OHSA

OHSA means the *Occupational Health and Safety Act*, R.S.O. 1990, c. O.1 as amended and any and all Regulations thereto”.

Proper Invoice

Proper Invoice means a written bill or other request for payment for services and/or materials comprising the *Work* performed under this *Contract* issued by the *Contractor*, provided such bill or request, contains the information set out in Section 6.1 of the *Construction Act*, which for certainty includes the following:

1. the *Contractor's* name and address;
2. the *Contractor's* HST registration number;
3. the date of the *Proper Invoice* and the period during which the services or materials were supplied to the *Owner*;
4. information identifying the authority, whether in this *Contract* or otherwise, under which the services or materials were supplied;

5. a description of the *Work*, or the portion thereof, including quantity where appropriate, of the services or materials that were supplied;
6. Name and address of the *Owner*, and *Owner's* unique *Project* number, if any;
7. Name and address of the *Project*;
8. the amount the *Contractor* is requesting to be paid by the *Owner*, separating out any reimbursable expenses, statutory or other holdbacks, set-offs, and HST;
9. the amount payable for the services or materials that were supplied, and the payment terms;
10. the name, title, telephone number and mailing address of the person at the *Contractor* to whom payment is to be sent; and

Any other information that may be prescribed by the *Construction Act*.

Submittals

Submittals are documents or other forms of information which the *Contractor* is required to submit to the *Owner* or the *Consultant* and include, without limitation, *Shop Drawings*, samples, models, record drawings, test reports, certificates, diagrams, and manuals.

Scheduled Ready-for-Takeover Date

Scheduled Ready-for-Takeover Date means December 18th, 2025.

Scheduled Total Completion Date

Scheduled Total Completion Date means thirty (30) days following *Ready-for-Takeover*. The *Scheduled Total Completion Date* shall only be amended in writing by the *Owner*.

Total Completion of the Work

Total Completion of the Work means the point in time when the *Work* is totally performed in accordance with the *Contract Documents*, including the rectification of all items on the *Deficiency List* and certified as such by the *Consultant*.

Warranty Punch List

Warranty Punch List has the meaning set forth in GC 12.3.8.

GENERAL CONDITIONS

GC 1.1 CONTRACT DOCUMENTS

Delete paragraph 1.1.3 in its entirety and replace with the following:

- “1.1.3 The *Contractor* shall review the *Contract Documents* for the purpose of facilitating, coordinating and executing the *Work*. The *Contractor* shall report promptly to the *Consultant* any ambiguities, design issues, or other matters requiring clarification made known to the *Contractor* or that the *Contractor* may discover from such a review. Such review by the *Contractor* shall comply with the standard of care described in paragraph 1.5.1.5 of the *Contract*.

Amend paragraph 1.1.4 by deleting “The” at the beginning of the paragraph and replacing with the following: “Except for the obligation to review the *Contract Documents* and report the result pursuant to paragraph 1.1.3, the”.

Amend paragraph 1.1.5.1 by moving “Supplementary Conditions” to the top of the order of priority.

Delete paragraph 1.1.10 in its entirety and substitute new paragraph 1.1.10 as follows:

“1.1.10 The design information furnished to the *Contractor* as part of the *Contract Documents*, including the *Drawings* and *Specifications*, are the property of the *Owner* and/or the *Consultant*, and are to be used by the *Contractor* only for the purposes of performing the *Work*. The *Contractor* shall not copy, alter, or utilize the aforesaid design information for any purpose unrelated to the *Work* without the prior written authorization from the *Owner* and/or the *Consultant*, as applicable.

Add new paragraphs 1.1.12 to 1.1.14 as follows:

“1.1.12 Where used in the *Contract Documents*, (a) the word “including” or “includes” or any variation thereof means including, without limitation, and (b) the word “person” includes a natural person and any other entity.

1.1.13 The *Drawings* are a diagrammatic view of the *Work* required but do not limit the extent of the *Work* required to totally complete the details of *Work* intended. It is the *Contractor’s* responsibility to apply their expertise to execute the *Work* by the *Contract Documents*. The *Contractor* shall coordinate all *Drawings* with the sizes and dimensions of services, fixtures, and equipment locations shown on the plans or as job conditions permit. Any changes required to facilitate and complete the installation of such services, fixtures or equipment shall be made at no additional cost to the *Owner*, unless a *Change Order* has been issued or there has been a negligent error or omission by the *Consultant*.

1.1.14 The *Contractor* shall keep one copy of the current *Contract Documents*, *Submittals*, reports and records of meetings at the *Place of the Work*, in good order and available to the *Owner* and *Consultant*.”

GC 1.4 ASSIGNMENT

Delete paragraph 1.4.1 in its entirety and insert the following:

“1.4.1 *Contractor* shall not assign the *Contract* or any portion thereof without the prior written consent of *Owner*, which consent shall not be unreasonably withheld. If *Owner* assigns this *Contract* or any party thereof, *Owner* shall provide written notice to the *Contractor* of such assignment.”

GC 1.5 PROJECT REQUIREMENTS

Add new “GC 1.5 Project Requirements” as follows:

“GC 1.5 PROJECT REQUIREMENTS

1.5.1 The *Contractor* represents, covenants, and warrants to *Owner* that:

- .1 it has the necessary high degree of experience and expertise required to perform the *Work* and it will in the performance of the *Work* exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent *Contractor* providing similar services, materials, and work for projects of a similar nature;
- .2 the personnel it assigns to the *Project* are experienced and it has a sufficient staff of qualified and competent personnel to replace its designated *Contract* personnel referred to in GC 3.6, subject to the *Owner's* approval, in the event of death, incapacity, termination, or resignation;
- .3 there are no pending, threatened or anticipated claims or litigation involving the *Contractor* that would have a material adverse effect on the financial ability of the *Contractor* to perform the *Work*;
- .4 it will achieve *Substantial Performance of the Work* and the *Total Completion Date* by the date set out in Article A-1, paragraph 1.3; and
- .5 in performing its services and obligations under the *Contract*, the *Contractor* shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The *Contractor* acknowledges and agrees that throughout the *Contract* and *Project*, the *Contractor's* obligations, duties, and responsibilities shall be interpreted in accordance with this standard. The *Contractor* shall exercise the same standard of due care and diligence in respect of any *Products*, personnel, and/or procedures which it may recommend to the *Owner*."

GC 1.6 CONFIDENTIALITY

Add new "GC 1.6 Confidentiality" as follows:

"GC 1.6 CONFIDENTIALITY

- 1.6.1 *Contractor* shall not, except as is required to carry out its obligations, duties, responsibilities, or liabilities under the *Contract*, divulge any confidential information communicated to or acquired by it in the course of carrying out its obligations, duties, responsibilities or liabilities under the *Contract*. No confidential information shall be used by the *Contractor* on any other project without the prior written consent and approval of the *Owner* (which approval may be arbitrarily withheld). The *Contractor* shall not have any proprietary rights to or interest in the confidential information, nor shall the *Contractor* have any right to license such information to any *Subcontractor*, *Supplier* or other third party. The term "confidential information" as used herein shall mean all information which the *Contractor* receives, either directly or indirectly, from the *Owner* or from the *Consultant*, except:
- .1 information which the *Contractor* can demonstrate is, at the time of disclosure, already known to the *Contractor*;

.2 information which, at the time of disclosure, is or thereafter becomes a part of the public domain through no act or omission on the part of the *Contractor*; and

.3 information which is disclosed to the *Contractor* by a third party without a covenant of confidentiality.

1.6.2 The *Contractor* may disclose the confidential information to those *Contractor* personnel, *Subcontractors* and *Suppliers* to whom disclosure is required for the performance of their respective responsibilities, duties, obligations, and liabilities under the *Contract*. The *Contractor* shall require such *Contractor* personnel, *Subcontractors* and *Suppliers* to treat such information as confidential and not to disclose such information to any person other than in accordance with the terms of the *Contract*.

1.6.3 The *Contractor* covenants and agrees that the confidentiality covenant contained herein shall survive the termination or discharge of date of such termination or discharge.”

GC 1.7 EXAMINATION OF DOCUMENTS, SITE AND TIME

Add new GC 1.7 EXAMINATION OF DOCUMENTS, WORK SITE AND TIME as follows:

“GC 1.7 EXAMINATION OF DOCUMENTS, WORK SITE AND TIME

“1.7.1 The *Contractor* represents and warrants that in tendering for the *Work*, and in entering into the *Contract* with the *Owner* for the performance of the *Work*, it has investigated for itself the character of the *Work* to be done and all local conditions existing at the *Place of the Work* and the surrounding area and it has satisfied itself as to the scope and character of the *Work*, all conditions and information affecting the *Work*, including the nature and location of the *Work*, access to the site and weather conditions.”

GC 2.2 ROLE OF THE CONSULTANT

Amend paragraph 2.2.3 by adding the following sentence to the end:

“The presence of such project representatives at the *Place of the Work* shall not relieve *Contractor* from any responsibility to perform the *Work* as required by the *Contract Documents*.”

Amend paragraph 2.2.5 by: (a) adding the words “to *Contractor*” after the words “The *Consultant* will not be responsible” in the first sentence of the paragraph; (b) adding the word “schedules” after the word “techniques”; (c) adding the following to the end of the second sentence “or to adhere to the construction schedule”; and (d) adding the following to the end of the paragraph:

“The *Consultant* will not have control over, charge of, or be responsible for, the acts or omissions of the *Contractor*, *Subcontractors*, *Suppliers*, or their agents, employees, or any other person performing any portion of the *Work*.”

Amend paragraph 2.2.6 by deleting “Except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER, the” and replacing with “The”.

Delete paragraph 2.2.12 and replace with the following:

“The *Contractor* shall be responsible for requesting any additional instructions or clarifications that may be required from the *Consultant* which are needed for the performance of the *Work*, and shall request such instructions or clarifications in time to avoid any delay or additional cost of the *Work*.”

Amend paragraph 2.2.13 by deleting the word “submittals” and replacing with “*Submittals*”.

Amend paragraph 2.2.18 by (a) deleting the word “immediately” and replacing with “, as soon as reasonably practicable,” and (b) deleting the words “against whom the *Contractor* makes no reasonable objection”.

Add new paragraph 2.2.19 as follows: “Verbal instructions and amendments, regardless of their source, shall not be binding.”

GC 2.3 REVIEW AND INSPECTION OF THE WORK

Amend paragraph 2.3.2 by inserting in line 1 “, *Commissioning*” after “inspections,”. Insert in line 3 “and *Commissioning*” after “inspection”.

Amend paragraph 2.3.3 by inserting in line 1 “, *Commissioning*” after “certificates.”

Amend paragraph 2.3.4 by inserting in line 2 “*Commissioning*” after “inspections,”. Insert in line 3 “or *Commissioning*” after “tests”.

Amend paragraph 2.3.5 by inserting “Subject to paragraph 2.3.4” at the beginning of the third sentence.

Amend paragraphs 2.3.6 and 2.3.7 by inserting “or *Commissioning*” after “inspection” in all instances.

Add new paragraph 2.3.8 as follows:

“The *Consultant*, *Owner*, and their representatives shall at all times have access to the *Project* and be permitted to examine the *Work* and materials used or to be used for the *Work*, and the *Contractor* agrees to provide reasonable facilities for such inspection.”

GC 2.4 DEFECTIVE WORK

Amend paragraph 2.4.1 by (a) adding the words “or the *Owner*” after the word “*Consultant*” in the first line, and (b) adding the following to the end of the paragraph:

“The *Contractor* shall rectify in a manner acceptable to the *Owner* all other defective work and like deficiencies throughout the *Work* whether or not they are specifically identified by the *Consultant*.”

Amend paragraph 2.4.3 by deleting the words “... the difference in value between the *Work* as performed and that called for by the *Contract Documents*” and insert the words “... the value of such *Work* as is necessary to correct any non-compliance with the *Contract Documents*.”

Add new paragraphs 2.4.4, 2.4.5 and 2.4.6 as follows:

- “2.4.4 The *Contractor* shall prioritize the correction of any defective work which, in the sole discretion of the *Owner*, adversely affects the day-to-day operations of the *Owner*.
- 2.4.5 Upon notification of a defect in the *Work*, the *Contractor* shall, within five working days, promptly provide a written statement outlining the proposed remedial measures and a schedule for implementation. Once approved by the *Consultant*, the *Contractor* shall proceed with the remedial measures without adversely affecting the construction schedule.
- 2.4.6 Notwithstanding any rejection of the *Work* by the *Consultant* or *Owner*, or the deduction of an amount otherwise due to the *Contractor* by the *Owner* as a result of defective work, the *Contractor* is required to continue the *Work* in accordance with the *Contract Documents*.”

GC 3.1 CONTROL OF THE WORK

Amend paragraph 3.1.1 by inserting “schedule, coordinate,” after the word “effectively”.

Amend paragraph 3.1.2 by (a) adding the word “schedules” after the word “techniques”, (b) deleting the word “under” and replacing with “in accordance with”, and (c) adding the following to the end of the sentence “and shall coordinate the *Work* so as not to interfere with, interrupt, obstruct, delay, or otherwise affect, the work of others”.

Add new paragraphs 3.1.3 and 3.1.4 as follows:

- “3.1.3 The *Contractor* shall verify, at the *Place of the Work*, all relevant measurements, and levels necessary for proper and complete fabrication, assembly and installation of the *Work* and shall further carefully compare such field measurements and conditions with the requirements of the *Contract Documents*. Where dimensions are not included or exact locations are not apparent, the *Contractor* shall immediately notify the *Consultant*, in writing, and obtain written instructions from the *Consultant* before proceeding with any part of the affected work.
- 3.1.4 *Contractor* shall perform the *Work* in a good and workmanlike manner, using new materials, in accordance with all applicable laws and current best practices and standards in the construction industry at the *Place of the Work*. *Contractor* acknowledges that both time and quality are of the essence and *Contractor* will perform the *Work* or cause the *Subcontractors* and *Suppliers* to perform the *Work* in accordance with the construction schedule.”

GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

Delete paragraphs 3.2.2.1 and 3.2.2.3 in their entirety and replace with “Intentionally deleted”.

Add new subparagraph 3.2.3.5 as follows:

- “3.2.3.5 Subject to **GC 9.4 CONSTRUCTION SAFETY**, for the *Owner’s* own forces and for *Other Contractors*, assume overall responsibility for compliance with all aspects of the applicable health and safety legislation in the *Place of the Work*, including all of the responsibilities of the “constructor” or “prime contractor” under the applicable

legislation. *Owner's* own forces and *Other Contractors* will be required to comply with the directions and instructions from the *Contractor*.

Delete the last sentence of paragraph 3.2.5 in its entirety.

Delete paragraph 3.2.6 and replace with the following:

“3.2.6 Entry by the *Owner's* forces and by other contractors does not indicate acceptance of the *Work* and does not relieve the *Contractor* of any responsibility under the *Contract* including the responsibility to complete the *Work* in accordance with the *Contract Documents*.”

Add new paragraph 3.2.7 as follows:

“3.2.7 Placing, installing, applying, and connecting of work by the *Owner's* own forces or by *Other Contractors*, on and to the *Work* will not relieve the *Contractor's* responsibility to provide and maintain the specified warranties unless a defect has been created by the *Owner's* own forces or *Other Contractors*.”

GC 3.3 TEMPORARY WORK

Add new paragraph 3.3.4 as follows:

“3.3.4 Temporary or trial usage of any mechanical device, machinery, apparatus, equipment or materials shall not be construed as evidence of acceptance of the same and no claim for damage shall be made by the *Contractor* for injury to or breaking of any part of such work which may be used.”

GC 3.4 CONSTRUCTION SCHEDULE

Delete paragraph 3.4.1 in its entirety and replace with the following:

“3.4.1 The *Contractor* shall:

- .1 prior to site mobilization and first application for payment, prepare and submit to the *Owner* and the *Consultant* for their review and acceptance a construction schedule indicating critical milestone dates for the Project, including, without limitation, the timing of the major activities of the *Work*, lead times for the ordering of any equipment or materials required to be purchased by the *Owner*, if any, and provides sufficient detail of the critical events and their interrelationship using a scheduling program which is the most current version, to demonstrate that the *Work* will be performed in conformity with the *Contract Time*;
- .2 provide the expertise and resources, including manpower and equipment, as are necessary to maintain progress under the construction schedule or any successor or revised schedule approved by the *Owner*;
- .3 monitor the progression of the *Work* relative to the construction schedule, or any successor or revised schedule approved by the *Owner*, update the schedule on a monthly basis, and advise the *Owner* and *Consultant* in writing of any slippage in the construction schedule or any other schedule; and

- .4 if after applying the expertise and resources required under paragraph 3.4.1.2, the *Contractor* forms the opinion that the slippage in the construction schedule or any other schedule cannot be recovered by the *Contractor*, the *Contractor* shall, in the same notice provided under paragraph 3.4.1.3, indicate to the *Owner* and *Consultant* if the *Contractor* intends to apply for an extension of *Contract Time*, including, the basis on which such application may form.”

Add new paragraphs 3.4.2 to 3.4.4 as follows:

- “3.4.2 In addition to the construction schedule, at each site construction meeting, the *Contractor*, shall provide to the *Owner* and *Consultant* a two (2) week look-ahead schedule indicating the major activities to be undertaken or constructed in the following two (2) week period.
- 3.4.3 If at any time it should appear to the *Owner* or the *Consultant* that the actual progress of the *Work* is behind schedule or is likely to become behind schedule, or if the *Contractor* has given notice to that effect to the *Owner* or the *Consultant*, the *Contractor* shall take appropriate steps to cause the actual progress of the *Work* to conform to the schedule and shall produce and present to the *Owner* and the *Consultant* a recovery plan demonstrating how the *Contractor* will achieve the recovery of the schedule. For delay to the schedule caused by the *Contractor* or anyone employed or engaged by the *Contractor* directly or indirectly, the *Owner* may instruct the *Contractor*, at the *Contractor's* expense, to employ additional labour and equipment or work overtime or employ any other reasonable procedures, at no expense to the *Owner*, to bring the *Work* back to conform with the schedule.
- 3.4.4 Without limiting the other obligations of the *Contractor* under paragraph 3.4.1, the *Contractor* shall not amend the construction schedule without the prior written consent of the *Owner*.”

GC 3.5 SUPERVISION

Add new paragraph 3.5.3 as follows:

- “3.5.3 The *Contractor's* site superintendent for the *Contract* shall devote their full time to the *Project* during working hours and remain at the *Place of the Work* until (a) a final certificate of payment has been issued by the *Consultant*, and (b) all deficiencies in the *Work* have been rectified to the satisfaction of the *Owner*. The full-time site superintendent for the *Contract* shall not be removed or replaced during the progression of the *Work* without the prior written consent of the *Owner*, which approval shall not be unreasonably withheld.”

GC 3.6 SUBCONTRACTORS AND SUPPLIERS

Amend paragraph 3.6.2 by inserting the following at the end of the paragraph:

“The *Contractor* agrees not to change *Subcontractors* without prior written approval of the *Owner*. Where the *Contractor* wishes to change identified *Subcontractors* or *Suppliers*, it shall set out in writing to the *Owner* sufficient reasons for the desired change. If the *Owner* is not satisfied with the *Contractor's* reason for wanting to change an identified *Subcontractor* or

Supplier, it shall have the *Consultant* notify the *Contractor* that its request is not acceptable to the *Owner* and that the *Contractor* is required to proceed with the identified *Subcontractor* or *Supplier*.”

Amend paragraph 3.6.4 by inserting the following at the end of the paragraph: “, unless the request to change a proposed *Subcontractor* or *Supplier* is a result of issues with the ability of the *Subcontractor* or *Supplier* to complete the *Work* in a proper or timely manner, in which case the *Contractor* will not be entitled to any change in *Contract Price* or *Contract Time*”.

Add new paragraph 3.6.7 as follows:

“3.6.7 The *Contractor* and its *Subcontractors* shall pay all of their respective *Subcontractors*, *Suppliers*, and workers that they employ such sums as are due to them. The *Contractor* shall take all necessary steps to ensure that the *Subcontractors* and *Suppliers* do likewise. All payments shall be made promptly when due and in accordance with applicable laws.”

GC 3.7 LABOUR AND PRODUCTS

Amend paragraph 3.7.1 by adding the following second sentence:

“The *Contractor* represents and warrants that it has sufficient skilled employees to replace, subject to the *Owner*’s approval, acting reasonably, its designated supervisor and project manager in the event of death, incapacity, removal or resignation.”

Add new paragraph 3.7.4 as follows:

“3.7.4 The *Contractor* is responsible for the safe on-site storage of *Products* and their protection (including *Products* supplied by the *Owner* and other contractors to be installed under the *Contract*) in such ways as to avoid dangerous conditions or contamination to the *Products* or other persons or property and in locations at the *Place of the Work* to the satisfaction of the *Owner* and the *Consultant*. The *Owner* shall provide all relevant information on the *Products* to be supplied by the *Owner*.”

GC 3.8 SHOP DRAWINGS

Add the words “**AND OTHER SUBMITTALS**” to the Title after **SHOP DRAWINGS**.

Add “and *Submittals*” after the words “*Shop Drawings*” in paragraphs 3.8.1, 3.8.2, 3.8.3, 3.8.5, 3.8.6, and 3.8.7.

Delete paragraph 3.8.3.1 in its entirety and substitute new subparagraph 3.8.3.1 as follows:

“.1 the *Contractor* has determined, verified and correlated all field measurements with the *Shop Drawings* and any *Submittals* and field construction conditions, *Product* requirements, catalogue numbers and similar data, or will do so if not possible at that time, and”

Delete paragraph 3.8.7 and replace with the following:

“3.8.7 The *Consultant* will review and return *Shop Drawings* and *Submittals* in accordance with the schedule agreed upon, or, in the absence of such schedule, within fifteen (15)

Working Days. If, for any reason, the *Consultant* cannot process them within the agreed-upon schedule or within fifteen (15) *Working Days*, the *Consultant* shall notify the *Contractor* and they shall meet to review and arrive at an acceptable revised schedule for processing. The *Contractor* shall update the *Shop Drawings* and *Submittals* schedule to correspond to changes in the construction schedule.”

Add new paragraphs 3.8.8 to 3.8.10 as follows:

- “3.8.8 The *Contractor* shall provide *Shop Drawings* and *Submittals* in the form specified in the *Contract Documents*, or if not specified, as directed by the *Consultant*.
- 3.8.9 *Shop Drawings* and *Submittals* provided by the *Contractor* to the *Consultant* shall indicate by stamp, date, and signature of the person responsible for the review that the *Contractor* has reviewed each one of them.
- 3.8.10 The *Contractor* shall provide revised *Shop Drawings* and *Submittals* to correct those which the *Consultant* rejects as inconsistent with the *Contract Documents*, unless otherwise directed by the *Consultant*. The *Contractor* shall notify the *Consultant* in writing of any revisions to the *Shop Drawings* or other *Submittals* other than those requested by the *Consultant*.”

GC 3.9 CLEAN UP

Add new GC 3.9 CLEAN UP as follows:

“GC 3.9 CLEAN UP

- 3.9.1 The *Contractor* shall, on a daily basis, maintain the *Work* in a safe and tidy condition and free from the accumulation of waste products and debris, other than that caused by the *Owner*, *Other Contractors* or their employees.
- 3.9.2 Before applying for *Substantial Performance of the Work* as provided in GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK, the *Contractor* shall remove waste products and debris, other than that resulting from the work of the *Owner*, *Other Contractors*, or their employees, and shall leave the *Place of the Work* clean and suitable for use or occupancy by the *Owner*. The *Contractor* shall remove products, tools, *Construction Equipment*, and *Temporary Work* not required for the performance of the remaining work.
- 3.9.3 Prior to application for the final payment, the *Contractor* shall remove any remaining products, tools, *Construction Equipment*, *Temporary Work*, and waste products and debris, other than those resulting from the work of the *Owner*, *Other Contractors*, or their employees.”

GC 3.10 USE OF THE WORK

Add new GC 3.10 – USE OF THE WORK as follows:

“GC 3.10 USE OF THE WORK

- 3.10.1 The *Contractor* shall confine *Construction Equipment*, *Temporary Work*, storage of *Products*, waste products and debris, and operations of employees and *Subcontractors* to limits indicated by laws, ordinances, permits, or the *Contract Documents* and shall not unreasonably encumber the *Place of the Work*.
- 3.10.2 The *Contractor* shall not load or permit to be loaded any part of the *Work* with a weight or force that will endanger the safety of the *Work*.
- 3.10.3 Except for those normally used during the performance of the *Work*, such as elevator, mechanical, electrical, hydro, the *Contractor* shall not use any service plant or equipment installed as part of the *Work* without prior written consent from the *Owner*. On receipt of such consent, the *Contractor* shall be subject to any conditions set out as part of such consent and shall be responsible for all costs, damage and compensation for wear and tear.
- 3.10.4 If storage or other areas are required for the *Work* in addition to the *Work Site*, *Contractor* shall be responsible for making arrangements to obtain the additional areas and obtaining any necessary permits, permission or authorization and, if required, for making permit, rental or other payments that may be required for such purpose.”

GC 3.11 DOCUMENTS AT THE SITE

Add new GC 3.10 – DOCUMENTS AT THE SITE as follows:

“GC 3.11 DOCUMENTS AT THE SITE

- 3.11.1 The *Contractor* shall keep one copy of the current *Contract Documents*, *Supplemental Instructions*, *Change Orders*, *Change Directives*, reviewed *Shop Drawings*, *Submittals*, reports and records of meetings at the *Place of the Work*, in good order and available to the *Owner* and *Consultant*.”

GC 3.12 RIGHT OF ENTRY

Add new GC 3.12 RIGHT OF ENTRY as follows:

“GC 3.12 RIGHT OF ENTRY

- 3.12.1 The *Owner* shall have the right to enter or occupy the *Work* in whole or in part for the purpose of placing fittings and equipment or for other uses before *Substantial Performance of the Work*, if, in the opinion of the *Consultant* and *Owner*, such entry or occupation does not prevent or substantially interfere with the *Contractor* in completion of the *Contract* within the *Contract Time*. Such entry or occupation shall not be considered as acceptance of the *Work* or in any way relieve the *Contractor* from responsibility to complete the *Contract* or its obligations under the *Contract*.
- 3.12.2 The use or occupancy of the *Work* or any part thereof by the *Owner* shall not be taken in any manner as an acceptance by the *Owner* of any work or any other part or parts of the *Work* or *Products* not in accordance with the *Contract Documents* or to relieve the *Contractor* or his surety from liability in respect of the observance or performance of

the *Contract* save to the extent that loss or damage is caused during such use or occupancy by the *Owner* or by persons for whom the *Owner* is responsible. In particular, without limiting the generality of the foregoing, the use or occupancy of the *Work* or any part thereof by the *Owner* shall not release the *Contractor* from liability, or waive or impair any rights of the *Owner*.”

GC 3.13 DOCUMENT REVIEW

Add new GC 3.13 DOCUMENT REVIEW as follows:

“GC 3.13 DOCUMENT REVIEW

3.13.1 The *Contractor* shall review the *Contract Documents* and shall report promptly to the *Consultant* any error, inconsistency, or omission the *Contractor* may discover. Such review by the *Contractor* shall comply with the standard of care described in paragraph 1.5.1 of the *Contract*. Except for its obligation to make such review and report the result, the *Contractor* does not assume any responsibility to the *Owner* or to the *Consultant* for the accuracy of the *Contract Documents*. The *Contractor* shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the *Contract Documents*, which the *Contractor* could not reasonably have discovered. If the *Contractor* does discover any error, inconsistency or omission in the *Contract Documents*, the *Contractor* shall not proceed with the work affected until the *Contractor* has received corrected or missing information for the *Consultant*”.

3.13.2 Neither the *Owner* nor the *Consultant* will be responsible for verbal instructions.”

GC 4.1 CASH ALLOWANCES

Delete paragraph 4.1.4 in its entirety and replace with the following:

“4.1.4 Where the actual cost of the *Work* under any cash allowance exceeds the amount of the allowance, any unexpended amounts from other cash allowances shall be reallocated, at the *Owner*’s direction, to cover the shortfall, and, in that case, there shall be no additional amount added to the *Contract Price* for overhead and profit. Only where the actual cost of the *Work* under all cash allowances exceeds the total amount of all cash allowances shall the *Contractor* be compensated for the excess incurred and substantiated, plus an amount for overhead and profit on the excess only, as set out in GC 6.1 – OWNER’S RIGHT TO MAKE CHANGE.”

Delete paragraph 4.1.7 in its entirety and substitute new paragraph 4.1.7:

“4.1.7 The *Contractor* shall provide a schedule prior to the first application for progress payment that shows when the *Owner* must authorize ordering of items called for under cash allowances to avoid delaying the progress of the *Work*.”

Add new paragraph 4.1.8 as follows:

“4.1.8 The *Owner* reserves the right to call, or to have the *Contractor* call, competitive bids for portions of the *Work*, to be paid for from cash allowances. If the *Owner* determines

to proceed with competitive bids, the *Contractor* shall comply with the directions of the *Owner*.”

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

Amend the heading, “**GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER**” to read, “**GC 5.1 FINANCING INFORMATION REQUIRED**”.

Delete paragraph 5.1.1 in its entirety and replace with “Intentionally deleted”.

Delete paragraph 5.1.2 in its entirety and replace with the following:

“During the performance of the *Contract*, the *Contractor* shall give *Owner Notice in Writing* of any material change in the *Contractor’s* financial arrangements that may impact the *Contractor’s* ability to perform its obligations under the *Contract*.”

GC 5.2 APPLICATIONS FOR PAYMENT

Delete paragraphs 5.2.1 to 5.4.8 and replace with the following:

- “5.4.1 At least five (5) *Working Days* prior to the submission of a *Proper Invoice*, the *Contractor* shall submit a draft application for payment to the *Consultant*, with a copy to the *Owner*. The *Consultant* and *Contractor* shall attend a payment meeting to discuss the draft application for payment, which meeting shall take place at least two (2) *Working Days* prior to the submission of the *Proper Invoice*. The *Owner* shall be given notice of the meeting and be entitled, but not required, to attend the meeting. The draft application for payment will be submitted in a format mutually agreed upon by the *Owner*, *Consultant*, and *Contractor*.
- 5.4.2 Applications for payment on account as provided in Article A-5 of the Agreement – PAYMENT shall be made pursuant to the delivery of *Proper Invoices* which shall be given to the *Owner* and the *Consultant* on a monthly basis as the *Work* progresses.
- 5.4.3 On or before the last calendar day of each month, the *Contractor* shall submit to the *Owner* and *Consultant* on a *Working Day*, a *Proper Invoice* for payment for the *Work*. The amount claimed shall be for the value, proportionate to the amount of the *Contract*, of *Work* performed and *Products* delivered to the *Place of the Work* as of the last day of the payment period.
- 5.4.4 The *Contractor* shall submit to the *Owner* and *Consultant*, at least fifteen (15) calendar days before the first application for payment, a schedule of values of parts of the *Work*, aggregating the total amount of the *Contract Price*, so as to facilitate evaluation of applications for payment. *Proper Invoices* shall be based on the schedule of values, once the schedule of values has been accepted by the *Owner* and *Consultant*, and shall comply with the provisions of this *Contract* and the *Payment Legislation*.
- 5.4.5 The *Contractor* shall submit, with each *Proper Invoice* after the first, a Statutory Declaration, on an original form of CCDC Document 9A-2001, declaring that payments in connection with the *Work*, as noted in the Statutory Declaration, have

been made to the end of the period immediately preceding that covered by the current application.

- 5.4.6 The *Contractor* shall submit, with each *Proper Invoice*, evidence of compliance with workers' compensation/workplace safety and insurance board legislation at the *Place of the Work*, including payments due thereunder, with each application for progress payment.
- 5.4.7 The *Contractor* shall cause payment to be made to all *Subcontractors*, trade contractors, workers and *Suppliers* promptly when due and payable in accordance with the *Construction Act*.
- 5.4.8 After receipt by the *Owner* and the *Consultant* of a *Proper Invoice* submitted by the *Contractor* in accordance with GC 5.4 – APPLICATIONS FOR PROGRESS PAYMENTS PURSUANT TO THE SUBMISSION OF PROPER INVOICES:
- .1 the *Consultant* will issue to the *Owner*, no later than ten (10) *Working Days* after the *Consultant's* receipt of the *Proper Invoice*, a certificate for payment in the amount applied for, or in such other amount as the *Consultant* determines to be properly due following its review of such *Proper Invoice*. The issuance by the *Consultant* to the *Owner* of such certificate for payment is solely for the *Owner's* internal purposes and the *Owner's* receipt or approval of such certificate shall not be a condition of, or obligation to, make payment of the *Proper Invoice* in respect of which such certificate has been issued;
 - .2 after the *Owner* has reviewed the *Proper Invoice* and the *Consultant's* review of the same, the *Contractor* may amend it if the *Owner* agrees in advance to the revision. For clarity, the form and date of the *Proper Invoice* cannot change despite such a revision; and
 - .3 the *Owner* shall make payments to the *Contractor* in accordance with GC 5.4.2."

GC 5.3 PAYMENT

Delete paragraph 5.3.1 in its entirety and replace with the following:

"After receipt by the *Consultant* and *Owner* of a *Proper Invoice* submitted by the *Contractor* in accordance with GC 5.2 – APPLICATIONS FOR PAYMENT, then subject to the provisions of the *Contract* and the *Payment Legislation*, including the issuance of a notice of non-payment, payment shall be made by *Owner* to *Contractor* of the amount outlined in the *Proper Invoice* within twenty-eight (28) calendar days of the *Owner's* receipt of the *Proper Invoice*. If a notice of non-payment is issued by the *Owner*, the *Owner* shall pay the *Contractor* the undisputed portion of the *Proper Invoice*, if any, within twenty-eight (28) calendar days after receiving the *Proper Invoice*."

GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK

Amend paragraph 5.4.1 by (a) deleting the words "20 calendar days" and substituting the words "fifteen (15) *Working Days*", and (b) adding the following to the beginning of the paragraph:

“When the *Contractor* considers that the *Work* is substantially performed, or if permitted by the lien legislation applicable to the *Place of the Work* a designated portion thereof which the *Owner* agrees to accept separately is substantially performed, the *Contractor* shall deliver to the *Consultant* and *Owner* a request for *Substantial Performance of the Work*, including a list of incomplete and defective or deficient work to be rectified, for review by the *Consultant* to establish *Substantial Performance of the Work* or substantial performance of the designated portion of *Work*.”

Delete paragraph 5.4.2 in its entirety and replace with “Intentionally deleted”.

Delete paragraph 5.4.3 in its entirety and replace with the following:

“Subject to terms and conditions of the *Contract*, the requirements of any *Payment Legislation*, and any notice of non-payment of holdback, the holdback amount authorized by the certificate for payment of the holdback shall be due and payable no later than ten (10) *Working Days* following the expiration of the holdback period stipulated in the *Payment Legislation* applicable to the *Place of the Work*. The *Owner* may retain out of the holdback amount any sums required by law to satisfy any liens against the *Work* or, if permitted by the lien legislation applicable to the *Place of the Work*, other third-party monetary claims against the *Contractor* which are enforceable against the *Owner*. ”

Amend paragraph 5.4.4 by deleting the word “The” at the beginning of the paragraph and replacing with: “Upon receipt of the certificate issued by the *Consultant* for *Substantial Performance of the Work* in accordance with GC 5.4.1.2, the”.

Amend paragraph 5.4.5 by adding deleting “hereby agrees to release, and shall release,” and replace with “may release”.

Add new paragraphs 5.4.7 and 5.4.8 as follows:

“5.4.7 Immediately following the issuance of the certificate of *Substantial Performance of the Work*, the *Contractor*, in consultation with the *Consultant* and *Owner*, shall create a *Deficiency List* and establish reasonable dates for finishing the *Work*, and correcting any deficient *Work*, including those items included on the *Deficiency List*, which in any event shall be consistent with the *Scheduled Total Completion Date*.”

5.4.8 For the purposes of *Substantial Performance of the Work*, the *Contractor* acknowledges that the improvement required by this *Contract*, cannot be considered “ready for use” until all items listed in paragraphs (a) through (d) below have been completed and/or provided in full to the *Owner*. The *Contractor* agrees that its failure to submit all of the listed materials and documentation in conformance with the *Contract Documents* shall constitute proper grounds for the *Consultant* to reject the *Contractor’s* application for *Substantial Performance of the Work*.

- (a) Submission of Warranties, Data Manuals and As-Built Drawings and Specifications in acceptable manner,
- (b) Instruction of *Owner* in the operation of systems,

- (c) Approval to occupy completed work, from authorities having jurisdiction,
 - (d) All systems and equipment started up and tested including final balancing required by the *Contract Documents*,
 - (e) All life safety systems verified by *Contractor* and *Consultant* as complying with the requirements of the *Contract Documents*, and
 - (f) All spare parts and maintenance materials,
- and any other materials or documentation required to be submitted under the *Contract*, together with written proof acceptable to the *Owner* and the *Consultant* that the *Work* is substantially performed in accordance with the requirements of the *Contract Documents* and the municipal government, utilities and other authorities having jurisdiction.”

GC 5.5 FINAL PAYMENT

Delete paragraph 5.5.1 in its entirety and replace with the following:

“5.5.1 When the *Contractor* considers that the *Work* is completed and satisfies the requirements of *Total Completion of the Work* and *Completion of Commissioning*, the *Contractor* shall submit an application for final payment. The *Contractor's* application for final payment shall be accompanied by any documents or materials not yet delivered as agreed to in writing by the *Owner* pursuant to paragraph 5.4.8 together with fully complete as-built *Drawings*. Should the *Contractor* fail to deliver any of the said documents, or other documents required to be delivered pursuant to the *Contract Documents*, the *Owner* shall be at liberty to withhold from amounts otherwise payable to the *Contractor*, an amount, in the discretion of the *Owner*, up to the full amount otherwise payable to the *Contractor* as security for the obligation of the *Contractor* to deliver the undelivered documents.”

Delete from the first line of paragraph 5.5.2 the words, “calendar days” and substitute the words “*Working Days*”.

Amend paragraph 5.5.3 by adding the following second sentence to the end of the paragraph: “The *Contractor* shall revise and resubmit the application after the *Contractor* has addressed the reasons given for the rejection.”

Delete paragraph 5.5.4 in its entirety and replace with the following:

“Subject to the *Consultant's* certification of the application for final payment provided for in paragraphs 5.5.2 and 5.5.3, any notice of non-payment, the provision of paragraph 10.4.1 of GC 10.4 – WORKERS’ COMPENSATION, and any legislation applicable to the *Place of the Work*, the *Owner* shall, no later than twenty-eight calendar days after the submission of the *Contractor's* application for final payment, pay the *Contractor* as provided in Article A-5 of the Agreement – PAYMENT, and in any event in compliance with *Payment Legislation*.”

GC 5.8 WITHHOLDING OF PAYMENT

Add new GC 5.8 WITHHOLDING OF PAYMENT as follows:

“GC 5.8 WITHHOLDING OF PAYMENT

5.8.1 Notwithstanding the provisions of GC 5.3 PAYMENT, GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK, and GC 5.5 FINAL PAYMENT, the *Owner* may withhold payment of any amounts otherwise due under the *Contract* on account of any costs or damages the *Owner* has incurred or, is likely to incur, by reason of:

- .1 defective or incomplete portions of the *Work* or damage to the work of other contractors not rectified in accordance with the *Contract* for which the *Contractor* is responsible;
- .2 failure of the *Contractor* to indemnify the *Owner* in accordance with the terms of the *Contract*;
- .3 failure of the *Contractor* to fulfil its obligations in respect of construction liens in accordance with GC 13.2; and
- .4 evidence of the *Contractor*'s failure to make payments to *Subcontractors* or *Suppliers*.

5.8.2 Where the *Owner* has withheld payment of any portion of the *Contract Price* pursuant to the provision of paragraphs 5.6.1 or 5.8.1, the *Owner* shall be entitled to apply such withheld portion towards any costs or damages suffered by the *Owner*.”

GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

Add new paragraphs 6.1.3 to 6.1.10 as follows:

- “6.1.3 The *Owner*, through the *Consultant*, reserves the right to authorize payment for a change in the *Work* by means of *Cash Allowance*. For greater certainty, the *Contractor* is not entitled to any mark-up for overhead and profit on such amounts.
- 6.1.4 In the event that any change to the *Work* results in a reduction in the *Contract Price*, the *Contractor* shall not be entitled to claim for any lost revenue, lost profit or loss of anticipated profit related thereto.
- 6.1.5 *Contractor* shall not be entitled to receive any compensation or extension of *Contract Time*, and *Owner* shall have no obligation or liability to pay compensation to *Contractor*, unless a *Change Order* or *Change Directive* has been issued to *Contractor*, in writing, and before *Contractor* commences with any work in respect of such *Change Order* or *Change Directive*.
- 6.1.6 There shall be no adjustments to the *Contract Time* or *Contract Price* or compensation or payment of any kind whatsoever including potential or contingent costs for matters such as loss of profit, loss of productivity, loss of opportunity or any other such losses based on the quantity, scope or cumulative value or number of changes in the *Work*

whether resulting from one or more *Change Orders* or *Change Directives*, unless agreed in writing by the parties in a *Change Order*.

- 6.1.7 Any *Change Order* or *Change Directive* shall clearly set out what, if any, extension of the *Contract Time* is anticipated as a result thereof and failing the inclusion of the same, *Contractor* shall be barred in making a claim for extension of the *Contract Time* in respect thereof.
- 6.1.8 When both additions and deletions covering related work or substitutions are involved in a change to the *Work*, payment, including overhead and profit, shall be calculated on the basis of the net difference, if any, with respect to that change in the *Work*.
- 6.1.9 Where a change in the *Work* involves additions, deletions, or other revisions to the *Work*, the *Contract Price* shall be increased or decreased, as applicable, only by the net actual value of the change in the *Work* plus the following:
- .1 *Contractor* mark-up for overhead and profit on its own work shall not exceed ten percent (10%);
 - .2 *Contractor* mark-up for overhead and profit on *Subcontractor* work shall not exceed five percent (5%);
 - .3 *Subcontractor* mark-up for overhead and profit on its own work shall not exceed ten percent (10%); and
 - .4 If a *Subcontractor* retains another *Subcontractor* (sub-subcontractor), no additional mark-up shall be charged to the *Owner* for the sub-subcontract work.
- 6.1.10 Overhead and profit may not be charged on changes in the *Work* where there is a net decrease to the *Contract Price*.

GC 6.2 CHANGE ORDER

Add new paragraph 6.2.3 as follows:

“6.2.3 Upon the *Owner* and *Contractor* signing a *Change Order*, the *Change Order* shall constitute full and final settlement of all matters addressed in the *Change Order*, including, without limitation, any increases or decreases of the *Contract Price* and/or changes to the *Contract Time* related to the subject matter of the *Change Order*.”

GC 6.3 CHANGE DIRECTIVE

Delete paragraphs 6.3.7.5, 6.3.7.11, 6.3.7.15, 6.3.7.17 and 6.3.7.18 and replace with “Intentionally deleted”.

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

Delete paragraph 6.4.1 and replace with the following:

“6.4.1 The *Contractor* shall immediately, and in no event, later than five (5) *Working Days* after first observance, notify the *Consultant* and the *Owner* in writing, if in *Contractor*’s opinion, the subsurface or otherwise concealed physical conditions at the *Place of the Work* which existed before the commencement of the *Work* and which differ materially

from those indicated in the *Contract Documents* or a reasonable assumption of probable conditions based thereon.”

Add new paragraphs 6.4.5 and 6.4.6 as follows:

- “6.4.5 The *Contractor* confirms that, prior to entering into this *Contract*, applying the standard of care described in paragraph 1.5.1, *Contractor* carefully investigated the *Place of the Work*, the character of the *Work*, the *Contract Documents*, and all local conditions that might affect or impact its obligations to carry out the *Work* by way of visual inspection or reasonable enquiry, and has satisfied itself as to the nature and extent of the *Work* required under the *Contract Documents*. Notwithstanding any other provision in the *Contract*, the *Contractor* is not entitled to compensation or to an extension of the *Contract Time* for conditions which could reasonably have been ascertained by the *Contractor* by such investigation undertaken prior to the submission of the bid.
- 6.4.6 *Contractor* shall not be entitled to claim, and waives its rights to make a claim, for any additional compensation or any increase to the *Contract Time* or *Contract Price*, if the *Contractor* fails to provide notice to the *Owner* as required in GC 6.4.1.”

GC 6.5 DELAYS

Add the following to the end of paragraphs 6.5.1 and 6.5.2 “but excluding any special, indirect or consequential losses or damages, including but not limited to, loss of use, loss of productivity, loss of revenue, overhead and/or profit”.

Amend paragraph 6.5.3.4 by (a) moving lines 2 to 6 under the “.4” so that it applies to the entirety of GC 6.5.3, and (b) adding to the end of paragraph 6.5.3 (the end of line 6) the following: “provided that such costs are reasonable (and, in any event, shall exclude any special, indirect or consequential losses or damages, including but not limited to, loss of use, loss of productivity, loss of revenue, overhead and/or profit).”

Delete paragraph 6.5.3.3 and replace with “epidemics and pandemics” after the word “conditions”.

Add new paragraphs 6.5.6 and 6.5.7 as follows:

- “6.5.6 If the *Contractor* is delayed in the performance of the *Work* by an act or omission of the *Contractor* or anyone employed or engaged by the *Contractor* directly or indirectly, or by any cause within the *Contractor’s* control, then the *Contractor* shall take appropriate steps to recover any lost time, and the costs of such recovery efforts shall be to the *Contractor’s* account. To the extent that the *Contractor* caused delay results in the *Owner* incurring additional costs and expenses and/or a change in the *Contract Time*, the *Contractor* shall be liable to the *Owner* for the *Owner’s* cost and damages arising therefrom, including but not limited to, all services required by the *Owner* from the *Consultant* as a result of such delay by the *Contractor* and, in particular, the cost of the *Consultant’s* services during the period between the date of *Substantial Performance of the Work* stated in Article A-1 herein as the same may be extended through the provision of these General Conditions and any later, actual date of *Substantial Performance of the Work* achieved by the *Contractor*.

- 6.5.7 The *Contractor* shall be responsible for the care, maintenance, and protection of the *Work*, in the event of a suspension or delay in the performance of the *Work*, regardless of the reason.”

GC 6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

Amend paragraph 6.6.5 by deleting the word “claim” in the second line and replacing with “necessary claim information”.

Add new paragraph 6.6.7 as follows:

- “6.6.7 The *Owner* may make claims arising out of the costs incurred for additional services provided by the *Consultant* resulting from the *Contractor*’s failure to perform the *Work* in accordance with the terms and conditions of the *Contract*. Before the *Owner* makes a claim arising out of issuance of requests for information. The *Consultant* will notify the *Owner* and *Contractor* where it has been determined that additional services will be required or have been provided in order not to cause a delay. The *Owner* shall make claims against the *Contractor* based on the *Consultant*’s invoices.”

GC 7.1 OWNER’S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR’S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT

Amend paragraph 7.1.2 by (a) delete the words “and if the *Consultant* has given a written statement to the *Owner* and *Contractor* which provides the detail of such neglect to perform the *Work* properly or such failure to comply with the requirements of the *Contractor* to a substantial degree”, and (b) deleting the words “including references to applicable provisions of the *Contract*”.

Delete paragraph 7.1.3.2 and replace with the following: “provides the *Owner* with a schedule acceptable to the *Owner*, acting reasonably, for such correction”.

Delete paragraph 7.1.5.2 and replace with the following:

- “7.1.5.2 withhold further payment to the *Contractor* until the *Owner* has completed all *Work* required by the *Contract Documents* and satisfied any of its costs or damages resulting from the *Contractor*’s default; and”

Amend paragraph 7.1.5.3 by deleting the words “as certified by the *Consultant*” in the first line.

Add new paragraph 7.1.7 as follows:

- “7.1.7 *Owner* may terminate the *Contract* at any time and for any reason upon providing the *Contractor* with at least thirty (30) calendar days prior written notice. In such event, *Owner* shall pay for the *Work* performed up to the effective date of termination and for any additional, verifiable, direct costs related directly to such termination which are an ordinary and reasonable consequence of the termination. *Owner* shall not be liable to *Contractor* for any other costs or damages whatsoever arising from such early termination of the *Contract*, including, without limitation, any indirect, consequential, or special damages, including, without limitation, loss of profits, loss of revenue, or loss of opportunity.”

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

Delete paragraph 7.2.2 and replace with the following:

“If the entirety of the *Work* is stopped or otherwise suspended for a period of sixty (60) calendar days or more under an order of a court or other *Governmental Authority* as the result of an act or default of the *Owner* or anyone employed or engaged by the *Owner*, the *Contractor* may, without prejudice to any other right or remedy that the *Contractor* may have, by giving the *Owner Notice in Writing*, terminate the *Contract*. This provision shall not apply, and the *Contractor* shall have no right to terminate this *Contract* pursuant to this GC 7.2.2, if the stoppage or suspension has ceased prior to the giving of the *Notice in Writing*.”

Delete paragraph 7.2.3.1 in its entirety and replace with “Intentionally deleted”.

Delete from subparagraph 7.2.3.4, the words, “except for GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER”.

Amend paragraph 7.2.4 by deleting “5” and substitute “15”.

Amend paragraph 7.2.5 by (a) deleting the words “reasonable profit” in line 2, (b) deleting the word “damages” in line 3 and substituting the words “direct damages”, and (c) deleting the period at the end of the paragraph and replacing it with a comma and adding the following words: “but excluding any special, indirect or consequential losses or damages, including but not limited to, loss of use, loss of productivity, loss of revenue, overhead and/or profit”.

Add new paragraph 7.2.6 as follows:

“7.2.6 The *Owner's* withholding of progress payments, holdback payment and/or final payments pursuant to GC 5.8 shall not constitute a default under GC 7.2.3 permitting the *Contractor* to stop the *Work* or terminate the *Contract*.”

GC 8.3 NEGOTIATION, MEDIATION AND ARBITRATION

Delete paragraph 8.3.6 in its entirety and replace with the following:

“8.3.6 If mediated negotiations are terminated, pursuant to the provisions in GC 8.2.5, either party may refer an unresolved dispute to the courts having jurisdiction over the dispute. Alternatively, if both parties consent, a dispute may be submitted to arbitration in accordance with rules and terms to be agreed upon by the *Owner* and *Contractor*.”

Delete paragraph 8.3.7 in its entirety and replace with “Intentionally deleted”.

GC 8.4 RETENTION OF RIGHTS

Add new paragraph 8.4.3 as follows:

“8.4.3 If the *Owner* elects to have a dispute resolved by arbitration, the *Contractor* agrees that this paragraph 8.4.3 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 is otherwise resolved between the parties; provided, however, that in no event shall the *Contractor*

be deprived of its right to enforce its lien against the *Project* should the *Owner* fail to satisfy any arbitral award. For greater certainty, nothing in this paragraph 8.4.3 shall prevent the *Contractor* from taking the steps required by the *Construction Act* to preserve and/or perfect a lien to which it may be entitled.”

GC 9.1 PROTECTION OF WORK AND PROPERTY

Delete paragraph 9.1.1.1 in its entirety and replace with the following:

“9.1.1.1 errors or omissions in the *Contract Documents* which the *Contractor* could not have discovered applying the standard of care described in paragraph 1.5.1;”

Delete paragraph 9.1.2 in its entirety and replace with the following:

“9.1.2 Before commencing any *Work*, the *Contractor* shall determine the locations of all underground utilities and structures indicated in or reasonably determinable from the *Contract Documents* or that are discoverable by applying to an inspection of the *Place of the Work* the degree of care and skill described in paragraph 1.5.1.”

Add new paragraph 9.1.5 as follows:

“9.1.5 The *Contractor* shall neither undertake to repair and/or replace any damage whatsoever to the *Work* of other contractors, or to adjoining property, nor acknowledge the same was caused or occasioned by the *Contractor*, without first consulting the *Owner* and receiving written instructions as to the course of action to be followed from either the *Owner* or the *Consultant*. However, where there is danger to life or public safety, the *Contractor* shall take such emergency action as it deems necessary to remove the danger.”

GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

Amend paragraph 9.2.6 by adding the following after the word "responsible":

“or whether any toxic or *Hazardous Substances* or materials already at the *Place of the Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* 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 *Owner* or others,”

Amend paragraph 9.2.7 by adding the following after “is responsible”:

“or that any toxic or *Hazardous Substances* or materials already at the *Place of the Work* prior to the *Contractor* commencing the *Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* is responsible in a manner which does comply with legal and regulatory requirements,”.

Amend paragraph 9.2.8 by adding the following after the word "responsible":

“or that any toxic or *Hazardous Substances* or materials already at the *Place of the Work* prior to the Contractor commencing the *Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* 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 *Owner* or others,”

Amend paragraph 9.2.8.3 by adding “, including cost incurred” after the word “incurred”.

Amend paragraph 9.2.8.4 by adding the words “and the *Consultant*” after the word “*Owner*”.

Add new paragraph 9.2.10 as follows:

“9.2.10 *Contractor* shall indemnify and hold harmless *Owner*, *Owner’s* other contractors and suppliers, and their agents and employees, from and against claims and demands, losses, costs, damage, actions, suits, or proceedings arising out of or resulting from exposure to, or the presence of, toxic or hazardous substances or materials which were brought onto or made at the *Place of the Work* by *Contractor*, its *Subcontractors*, *Suppliers*, employees, agents or representatives after *Contractor* commenced the *Work*. This obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity set out in GC 13.1 INDEMNIFICATION or which otherwise exist respecting a person or party described in this paragraph.”

GC 9.4 CONSTRUCTION SAFETY

Delete paragraphs 9.4.1 to 9.4.7 in their entirety and replace with the following:

“9.4.1 The *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance by it and its *Subcontractors* and *Suppliers* with the applicable construction health and safety legislation. The *Contractor* shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the *Work*. The *Contractor* hereby accepts the designation of “constructor” or “prime contractor” as defined in the health and safety legislation applicable to the *Place of the Work*, and responsibility for the obligations and liabilities associated therewith.”

9.4.2 Prior to the commencement of the *Work*, the *Contractor* shall submit to the *Owner*:

- .1 a workplace safety and insurance certificate applicable to the *Place of the Work*;
- .2 copies of the *Contractor’s* insurance policies having application to the *Project* or certificates of insurance, at the option of the *Owner*; and
- .3 documentation of the *Contractor’s* in-house safety-related programs.

9.4.3 The *Contractor* hereby represents and warrants to the *Owner* that appropriate health and safety instruction and training has been provided, and/or will be provided, to the *Contractor’s* employees and *Subcontractors*, *Suppliers* and any one for whom the

Contractor is responsible, before the *Work* is commenced and agrees to provide to the *Owner*, if requested, proof of such instruction and training.

- 9.4.4 The *Contractor* shall ensure all of the *Work* is performed in a safe manner. Without limiting the generality of the foregoing, the *Contractor* shall ensure that all of its employees and *Subcontractors* are fully acquainted and comply with the *Contractor's* health and safety requirements, policies and procedures, and all the applicable laws, statutes and regulations. In addition, the *Contractor* shall ensure that all its employees and *Subcontractors* are, and remain, in full compliance with the applicable safety requirements prior to the commencement of the work and at all times during which the *Work* is performed.
- 9.4.5 The *Contractor* shall indemnify and save harmless the *Owner*, the *Consultant* and their respective agents, officers, directors, employees, consultants, successors and assigns from and against the consequences of any and all safety infractions committed by the *Contractor* or those for whom the *Contractor* is responsible, including the payment of legal fees and disbursements on a solicitor and client basis.
- 9.4.6 In the event that the *Owner* engages other contractors at the *Place of the Work* or performs work with its own forces, the *Owner* shall require such other contractors and its own forces to comply with directions and instructions of the *Contractor* in respect to health and safety and related matters at the *Place of the Work*."

GC 9.5 MOULD

Amend paragraph 9.5.2.3 by adding the following words "and any other costs and expenses reasonably incurred by the *Owner* in respect of the presence of such mould," after the words "paragraph 9.5.1.3,"

Amend paragraph 9.5.2.4 by adding the words "and the *Consultant*" after the word "*Owner*".

Delete paragraph 9.5.3.3 in its entirety and replace with the following:

- "9.5.3.3 extend the *Contract Time* for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. If, in the opinion of the *Consultant*, the *Contractor* has been delayed in performing the *Work* and/or has incurred additional costs under paragraph 9.5.1.2, the *Owner* shall reimburse the *Contractor* for its reasonable costs incurred as a result of the delay as certified by the *Consultant*, and"

GC 10.1 TAXES AND DUTIES

Add new paragraph 10.1.3 as follows:

- "10.1.3 The *Owner* shall be entitled to all available refunds or rebates of all taxes and custom duties applicable to the *Contract*, and the *Contractor* shall cooperate with the *Owner* in ascertaining the amount of such tax and custom duties and, if necessary, claim on

its own behalf and transfer to the *Owner* or facilitate a direct claim by the *Owner* for any such available refund or rebate.”

GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

Amend paragraph 10.2.3 by adding the following to the end of paragraph: “The *Contractor* shall be responsible for the procurement and payment of construction deposits levied by the municipality in connection with the issuance of a building permit”.

GC 11.1 INSURANCE

Delete paragraph 11.1.3 in its entirety and substitute the following: “The *Contractor* shall be solely responsible for any deductible amounts under the required policies of insurance.”

GC 11.2 CONTRACT SECURITY

Add new GC 11.2 CONTRACT SECURITY as follows:

“GC 11.2 CONTRACT SECURITY

11.2.1 If required by the *Contract Documents*, the *Contractor* shall deliver to the *Owner* prior to the commencement of the *Work* a performance bond and a labour and material payment bond each in the amount of fifty percent (50%) of the *Contract Price*. The form of such bonds shall be in accordance with the latest edition of the CCDC approved bond forms.

11.2.2 Such bonds shall be issued by a duly licensed surety company authorized to transact business of suretyship in the province or territory in the *Place of the Work* and shall be maintained in good standing until the fulfillment of the *Contract*.”

GC 12.1 READY-FOR-TAKEOVER

Amend paragraph 12.1.2 by deleting “paragraphs 12.1.1.3 to” and replacing with “paragraph”.

Amend paragraph 12.1.4 by (a) deleting the words “and will” in the first line, and (b) deleting “10 calendar days” and replacing with “fifteen (15) *Working Days*, or such longer period as may be reasonably required in the circumstances”.

GC 12.2 EARLY OCCUPANCY BY THE OWNER

Delete paragraphs 12.2.1 to 12.2.4 in their entirety and replace with the following:

“12.2.1 The *Owner* shall have the right to enter or occupy the *Work* in whole or in part for the purpose of placing fittings and equipment or for other uses before *Substantial Performance of the Work*, if, in the opinion of the *Consultant* and *Owner*, such entry or occupation does not prevent or substantially interfere with the *Contractor* in completion of the *Contract* within the *Contract Time*. Such entry or occupation shall not be considered as acceptance of the *Work* or in any way relieve the *Contractor* from responsibility to complete the *Contract* or its obligations under the *Contract*.

12.2.2 The use or occupancy of the *Work* or any part thereof by the *Owner* shall not be taken

in any manner as an acceptance by the *Owner* of any work or any other part or parts of the *Work* or *Products* not in accordance with the *Contract Documents* or to relieve the *Contractor* or its surety from liability in respect of the observance or performance of the *Contract* save to the extent that loss or damage is caused during such use or occupancy by the *Owner* or by persons for whom the *Owner* is responsible. In particular, without limiting the generality of the foregoing, the use or occupancy of the *Work* or any part thereof by the *Owner* shall not release the *Contractor* from liability, or waive or impair any rights of the *Owner*.”

GC 12.3 WARRANTY

Amend paragraph 12.3.6 by adding “, unless otherwise required by the *Contract Documents*” to the end of the third sentence.

Add new paragraphs 12.3.7 to 12.3.9 as follows:

- “12.3.7 Within thirty (30) calendar days prior to the expiry of the warranty period, the *Owner*, with the involvement and participation of the *Contractor* shall carry out a detailed and exhaustive inspection of the *Work* for the purpose of establishing a final deficiency list (the “Warranty Punch List”). The *Contractor* shall promptly correct, at the *Contractor*’s expense, any and all defects and deficiencies in the *Work* noted in the Warranty Punch List.
- 12.3.8 The *Contractor* shall, upon receiving notice of any defect or deficiency in the *Work*, commence the correction of such defect or deficiency within five (5) *Working Days* (or as otherwise agreed with the *Owner*) at such times that are convenient to the *Owner* except that, if any such defect or deficiency is of a nature which prevents or hinders, or is likely to prevent or hinder, resident or patient care, comfort or safety, or any life safety, security or other material building system, such correction shall be carried out immediately. The correction of all defects and deficiencies shall be carried out in a manner to minimize any interference or disruption to resident or patient care, comfort and safety. If the correction of any defect or deficiency is likely to disrupt or interfere with the tenant’s comfort, safety or any life safety, security or other material building system, the *Owner* shall be entitled to affect any temporary corrective action as the *Owner* shall deem appropriate and charge the cost thereof to the *Contractor*.
- 12.3.9 Prior to the application for final payment under GC 5.7.1, the *Contractor* shall assign to the *Owner* the benefit of all guarantees and warranties for all *Products* and services used or incorporated in the *Work*, as required by the *Contract Documents*, and shall ensure that such an assignment is also affected by all *Subcontractors* and/or *Suppliers* from whom the same have been obtained.”

GC 13.1 INDEMNIFICATION

Delete paragraph 13.1.1 in its entirety and substitute the following:

- “13.1.1 The *Contractor* shall indemnify and hold harmless the *Owner*, the *Consultant* and their respective agents and employees (the “*Owner Parties*”) from and against claims, demands, losses, costs, damages, actions, suits, or proceedings by third parties that arise

out of, or are attributable to, the *Contractor's* performance of the *Work* or anyone for whose acts the *Contractor* may be liable including *Subcontractor* and Suppliers. The *Contractor's* obligation to indemnify under this GC 13.1.1 shall be limited as follows:

- (a) in respect of losses suffered by the *Owner Parties* for which insurance is to be provided by the *Contractor* under this Contract, the obligation to indemnify shall be limited to the amounts of such insurance,
- (b) in respect of losses suffered by the *Owner Parties* for which insurance is not required or is insufficient, the obligation to indemnify shall be limited to the *Contract Price*, as may be amended, and
- (c) in respect of indemnification respecting claims by third parties, the obligation shall have no limit.

Delete paragraph 13.1.2 in its entirety and substitute the following:

“13.1.2 The *Owner* shall indemnify and hold harmless the *Contractor*, the *Contractor's* agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of the *Contractor's* 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 *Place of the Work*.”

Delete paragraph 13.1.5 in its entirety and replace with “Intentionally deleted”.

Add new paragraph 13.1.7 as follows:

“13.1.7 *Owner* shall not be liable in any circumstance for loss of profit, loss of productivity, loss of profit, or business shutdown or indirect, consequential or punitive damages, whether such liability arises in contract, tort, indemnity or on any other basis whatsoever.”

GC 13.2 WAIVER OF CLAIMS

Delete paragraphs 13.2.3, 13.2.4, 13.2.5 and 13.2.10 and replace with “Intentionally deleted.”

PART 14 OTHER PROVISIONS

Add new PART 14 - OTHER PROVISIONS as follows:

“PART 14 – OTHER PROVISIONS

GC 14.1 OWNERSHIP OF MATERIALS

14.1.1 Unless otherwise specified, all materials existing at the *Place of the Work* at the time of execution of the *Contract* shall remain the property of the *Owner*. All *Work* and *Products* delivered to the *Place of the Work* by the *Contractor* shall be the property of the *Owner*. The *Contractor* shall remove all surplus or rejected materials as its property when notified in writing to do so by the *Consultant*.

GC 14.2 CONSTRUCTION LIENS

- 14.2.1 *Contractor* shall ensure that *Owner's* title to the *Place of the Work* and *Project* are kept free and clear of all construction liens and certificates of action claimed by any person providing services and/or materials to *Contractor* for the *Project*. For greater certainty, this GC 14.2 shall not apply to construction liens or certificates of action that arise as a direct result of the failure by *Owner* to pay *Contractor* amounts properly due in accordance with the terms of this *Contract*.
- 14.2.2 If a claim for lien or certificate of action arising from the performance of the *Work* is registered against the *Project* or the *Place of the Work*, or given to the *Owner*, the *Contractor* shall, within ten (10) *Working Days* of becoming aware of such claim for lien or certificate of action, at *Contractor's* expense, vacate, discharge, or remove the claim for lien and/or certificate of action from title to the *Place of the Work*.
- 14.2.3 If a written notice of a lien arising from the performance of the *Work* is given to the *Owner*, the *Contractor* shall, within ten (10) *Working Days* of becoming aware of such lien, at its expense, vacate or arrange for the withdrawal of the written notice of a lien.
- 14.2.4 If the *Contractor* fails or refuses to vacate or discharge a claim for lien or certificate of action or fails or refuses to vacate or arrange for the withdrawal of a written notice of a lien, within the time prescribed in paragraphs 14.2.2 and 14.2.3 (as applicable), the *Owner* shall, at its option, be entitled to take all steps necessary to vacate, discharge, and/or have withdrawn, the claim for lien, certificate of action, and/or written notice of a lien and all costs and expenses incurred by the *Owner* in doing so (including, without limitation, all legal fees on a full indemnity basis and any payment which may ultimately be made out of or pursuant to security posted to vacate the claim for lien, certificate of action, or written notice of a lien) shall be for the account of the *Contractor*, and the *Owner* may deduct such amounts from the amounts otherwise due or owing to the *Contractor* and/or claim as damages.

GC 14.3 DAILY REPORTS/DAILY LOGS

- 14.3.1 The *Contractor* shall cause its supervisor, or such competent person as it may delegate, to prepare a daily log or diary reporting on weather conditions, work force of the *Contractor*, *Subcontractors*, *Suppliers*, and any other forces on site and also record the general nature of *Project* activities (the "**Daily Log**"). The *Daily Log* shall also include any extraordinary or emergency events which may occur and also the identities of any persons who visit the site who are not part of the day-to-day work force.
- 14.3.2 The *Contractor* shall also maintain records, either at its head office or at the job site, recording manpower and material resourcing on the *Project*, including records which document the activities of the *Contractor* in connection with GC 3.4, and comparing that resourcing to the resourcing anticipated when the most recent version of the schedule was prepared pursuant to GC 3.4. *Contractor* shall make these records available to *Owner*, upon request of *Owner*.
- 14.3.3 The *Contractor* shall submit a copy of the Daily Log to the *Owner* at the end of each calendar week and/or at other times upon the request of the *Owner*.

GC 14.4 INTERRUPTION OF UTILITIES

14.4.1 With respect to any interruption of existing utilities that provide services to the *Owner*:

- .1 The *Contractor* will give a minimum of ten (10) calendar days (or such longer period as the *Owner* shall reasonably require) advance written notice to the *Owner* and obtain written authorization from the *Owner's Project* representative prior to any interruption of existing services including, but not limited to, water, sewer, gas, medical gas systems, sprinklers, HVAC, power and electric, fire alarms, communication and security systems. The *Owner* may order the *Contractor* to stop the *Work* at any time due to emergency conditions and require required services to restart. The *Owner* may also order the *Contractor* to stop the *Work* at any time if any aspect of the *Work* affects or threatens to affect the continuous operation of the *Owner's* facilities and operations.
- .2 The *Owner* will cooperate with the *Contractor*, at no cost to the *Contractor*, in the shut down of services as is necessary to allow the *Contractor* to modify existing services and to perform the *Work*. If, however, as a result of defective materials or workmanship it is necessary for any shutdowns to be repeated, any additional costs incurred by the *Owner*, including the cost of labour provided by the *Owner*, to repeat the shutdown and then re-connect the service, will be paid by the *Contractor*.
- .3 The *Contractor* shall take measures to avoid triggering false alarms, including fire or security alarms, and will pay for any municipal costs charged to the *Owner* as a result of false alarms.
- .4 The *Contractor* shall provide the necessary coverage as required by applicable *Governmental Authorities* in the event of the loss of or lack of coverage of life safety systems.
- .5 The *Contractor* shall make service connections or modifications outside of normal working hours, or will provide temporary service connections, if such connections or modifications cannot be undertaken safely during normal working hours, or if such work would cause interruptions and interference with the *Owner's* normal business operations that are unacceptable to the *Owner*.
- .6 The *Contractor* will carry out all final connections to existing operational systems under the direct supervision and as directed by the *Owner's* operational staff or authorized agent.

GC 14.5 HOSPITAL RELATED PROVISIONS

- 14.5.1 The *Contractor* acknowledges that the security and safety of the patients, employees and other occupants of the existing *Hospital* is paramount. If any of the employees of the *Contractor* or the *Subcontractors* is determined by the *Owner* to be a concern for the security or safety of such patients, employees or occupants, the *Owner* may require that the *Contractor* replace such employee.
- 14.5.2 Notwithstanding any other provision in the *Contract*, paramountcy of access must be given to emergency and police vehicles and no claim may be made by the *Contractor*

for any delay in the performance of the *Work* as a result of any temporary lack of access to the *Place of the Work* resulting from this paramountcy of access by emergency and police vehicles, provided that the *Owner* will use commercially reasonable efforts to avoid and to limit the duration of any temporary lack of access for this reason.

- 14.5.3 The *Owner* has the authority, but without the obligation, to stop the *Work* in any circumstance affecting the safety of life or property or which otherwise may cause an unsafe condition for the operation of the existing *Hospital*. The *Contractor* shall abide by the *Owner*'s instructions to stop the *Work* without any extension in the *Contract Time* if such circumstance was caused by the *Contractor*, *Subcontractors* or *Suppliers*."

Summary of Work

PART 1 - GENERAL

1.1 Section Includes

- .1 *Contract Documents* conventions.
- .2 *Contract Documents* for construction purposes.
- .3 Law, notices, permits and fees.
- .4 Documents at the *Place of the Work*.
- .5 Use of premises and the *Place of the Work*.
- .6 Not in *Contract* items.
- .7 Electronic files.
- .8 Seismic design requirements.
- .9 Performance of the *Work*.

1.2 *Contract Documents* Conventions

- .1 The *Contract Documents* have been arranged into various divisions, sections, drawings, and schedules for the purpose of presenting the *Work* in a logical and organized form and to enable ease of reference and interpretation, and are not intended to be an arrangement of precise and independent *Subcontractors*, or jurisdiction of responsibility for the various parts of the *Work*.
 - .1 The *Contractor* shall be solely responsible for coordinating the execution of the *Work* of this *Contract* in accordance with the requirements of the *Contract Documents*.
 - .2 The *Consultant* and *Owner* shall not be required to decide on questions arising with regard to agreements or contracts between the *Contractor* and *Subcontractors* or *Suppliers*, nor to the extent of the parts of the *Work* assigned thereto, nor to establish subcontract limits between Sections or Divisions of the *Work*.
 - .3 No extra will be allowed as a result of the failure to coordinate and allocate the *Work* such that the *Work* is provided in accordance with the *Contract Documents*.
- .2 The *Specifications* are written in the imperative mood and in streamlined form. The imperative language is directed to *Contractor*, unless stated otherwise.
- .3 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.
- .4 Fulfill and perform all indicated requirements whether stated imperatively or otherwise.
- .5 When used in the context of a *Product*, read the word "provide" to mean "supply and install to result in a complete installation ready for its intended use".

Summary of Work

- .6 Named *Products* alternates or equals, indicated by the phrases "or approved alternate by XYZ Manufacturing" or "or approved equal by XYZ Manufacturing", shall be interpreted to mean that named *Product* alternate or equal, if selected for use in lieu of indicated or specified *Product*, meets or exceeds performance, appearance, general arrangement, dimensions, availability, code and standards compliance, and colour of specified *Product*. Be responsible for costs and modifications associated with the inclusion of named *Product* alternate or equal at no additional cost to the *Owner*.
- .7 The use of the words "include" or "including", or variations thereof, within the *Contract Documents* is not limiting.
- .8 The words "make good" or "making good" shall mean that, when a finish or material has been altered, the material or finish shall be repaired or replaced, and refinished to match existing quality and appearance to acceptance of *Consultant*, and that repaired or replaced and refinished *Work* shall not be discernible from existing materials or finishes when judged by the *Consultant* from a viewing distance of 1830 mm (6'), and that such work is included in the *Contract Price*.
- .9 Where a component, device, item or part of materials or equipment is referred to in the singular number, such reference shall require the provision of as many components, devices, items or parts of material or equipment necessary to complete the *Work*.
- .10 Reference standards:
 - .1 "Reference standards" means consensus standards, trade association standards, guides, and other publications expressly referenced in *Contract Documents*.
 - .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, except as follows:
 - .1 If a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the edition or version referenced in the applicable code or other regulatory requirement shall apply.
 - .3 The *Contract Documents* may specify, indicate, or schedule requirements that exceed the requirements of the building code, other applicable codes, requirements of authorities having jurisdiction, and standards cited in the *Contract Documents*. In such cases, the requirements specified, indicated, or scheduled in the *Contract Documents* shall govern.
 - .4 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.

1.3 **Contract Documents for Construction Purposes**

- .1 *Owner* shall supply *Contractor* with a complete set of *Contract Documents* in electronic form before commencement of the *Work*.

1.4 **Laws, Notices, Permits, and Fees**

- .1 The building code - Ontario Regulation 332/12, including amendments, shall govern the *Work*.

Summary of Work

- .2 Comply with codes, by-laws, and regulations of authorities having jurisdiction over the *Place of the Work*. Codes and regulations form an integral part of the *Contract Documents*.
- .3 *Owner* shall apply and pay for the building permit. The *Contractor* shall pick up building permit from the municipal department having jurisdiction at the *Place of the Work*.
 - .1 Obtain and pay for all other permits, licenses, deposits and certificates of inspection as part of the *Work*.
- .4 Arrange for inspection, testing and acceptance of the *Work* required by the authorities having jurisdiction. Be responsible for necessary preparations, provisions and pay costs.
- .5 Obtain permits required to execute work on municipal rights of way. Obtain damage deposits for sidewalks, roads and services, unless otherwise indicated.
- .6 It is the responsibility of the *Contractor* to schedule notifications and inspections required by authorities having jurisdiction such that notifications can be properly received and that inspections can be properly undertaken without causing a delay in the *Work*. The *Contractor*, at no additional cost to the *Owner*, shall be solely responsible for any delay in the *Work* caused by failure to properly schedule required notifications and inspections.
- .7 The *Contractor* shall provide to the chief building official or the registered code agency, where a registered code agency is appointed under the Ontario Building Code Act in respect of the construction to which the notice relates, the required notices set out in Division C – Part 1 Sentence 1.3.5.1(2) and Sentence 1.3.5.2 of the Ontario Building Code, O. Reg. 332/12 as amended. The *Contractor* shall be present at each site inspection by an inspector or registered code agency as applicable under Division C – Part 1 Sentence 1.3.5.2 of the building code.
 - .1 It is the responsibility of the *Contractor* to schedule notifications to the chief building official or the registered code agency such that the inspection pertaining to the notifications can be made within the time frame as required under Division C – Part 1 Sentence 1.3.5.3 of the Ontario Building Code, O. Reg. 332/12 as amended, without causing a delay in the *Work*. The *Contractor*, at no additional cost to the *Owner*, shall be solely responsible for any delay in the *Work* caused by failure to properly schedule required notifications and inspections.

1.5 Documents at the *Place of the Work*

- .1 Maintain at the *Place of the Work*, one copy of each of following:
 - .1 *Contract Documents* including drawings, specifications, addenda, and other modifications to the *Contract*.
 - .2 'Reviewed' or 'Reviewed as Noted' submittals.
 - .3 Construction and submittal schedules.
 - .4 *Supplemental Instructions*, proposed *Change Orders*, *Change Orders*, and *Change Directives*.
 - .5 RFI responses and RFI log.
 - .6 Field test reports and independent testing reports.
 - .7 *Consultant's* field review reports and deficiency reports.

Summary of Work

- .8 Manufacturer's field review reports.
- .9 Reports by authorities having jurisdiction.
- .10 Building and other applicable permits, and related permit documents.
- .11 Daily log including:
 - .1 Number of workers actively working at the *Place of the Work* by each subcontract.
 - .2 *Subcontractors* working at the *Place of the Work*.
 - .3 Parts of the *Work* being worked on.
 - .4 Working hours worked at the *Place of the Work*.
 - .5 Activities with intermittent progress.
 - .6 Time lost and explanation for such time lost.
 - .7 Difficulties (work scheduled to start but did not with the reason why, delays, labour inefficiencies, labour shortage).
 - .8 *Products* and materials delivered.
 - .9 Equipment mobilized and/or demobilized.
 - .10 Demolition conditions.
 - .11 Start and finish date of each part of the *Work*.
- .12 As-built drawings recording as-built conditions, instructions, changes for structure, equipment, wiring, plumbing, and the like, as called for in Section 01 78 00 and Mechanical drawings and specifications, prior to being concealed.
- .2 Make above material available to *Consultant* upon request.

1.6 Use of Premises and the *Place of the Work*

- .1 Except as otherwise specified, *Contractor* has unrestricted use of *Place of the Work* from time of *Contract* award until *Ready-for-Takeover*.
- .2 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*.

1.7 Not In Contract Items and Owner Supplied Items

- .1 NIC (Not In *Contract*) and OS/OI (Owner Supplied/Owner Installed) shall be used to designate various items of equipment that require coordination for installation although are not provided as part of the *Work*.
- .2 OS/CI (Owner Supplied/Contractor Installed) shall be used to designate various items of equipment that will be supplied by the *Owner* for installation by the *Contractor* as part of the *Work*.
 - .1 *Owner Responsibilities*:

Summary of Work

- .1 Order and pay for items supplied by *Owner* not already in *Owner's* possession.
- .2 Arrange and pay for delivery of items supplied by *Owner* F.O.B. the *Place of the Work*, within time frames required by *Contractor's* progress schedule. If delivered sooner than required by *Contractor's* latest progress schedule submitted to *Owner*, arrange and pay for delivery to a temporary storage location and subsequent delivery to the *Place of the Work*.
- .3 Advise *Contractor* in writing of the value of items supplied by *Owner* for *Contractor's* insurance purposes.
- .4 Arrange and pay for delivery to *Contractor* of reviewed shop drawings, *Product* data, samples, and manufacturer's installation instructions.
- .5 Inspect deliveries jointly with *Contractor*.
- .6 Submit claims for transportation damage.
- .7 Arrange for replacement of damaged, defective or missing items identified at time of delivery.
- .8 Arrange for manufacturer's field services.
- .9 Arrange for delivery of manufacturer's warranties to *Contractor* for inclusion in operation and maintenance manual.
- .2 *Contractor* Responsibilities:
 - .1 Designate in progress schedule, time frames for delivery of items supplied by *Owner* to the *Place of the Work* and for receipt of related submittals. If the *Place of the Work* is not ready to receive delivery of items supplied by *Owner* within the time frame indicated in the latest progress schedule submitted to *Owner*, arrange and pay for delivery to a temporary storage location and subsequent delivery to the *Place of the Work*.
 - .2 Review all required submittals and notify *Consultant* of any observed discrepancies or anticipated problems.
 - .3 Ensure that course of construction insurance is adequate to cover items supplied by *Owner*.
 - .4 Receive and unload items supplied by *Owner* at the *Place of the Work*.
 - .5 Inspect deliveries jointly with *Owner*. Record and notify *Owner* and *Consultant* of shortages and visibly damaged or defective items.
 - .6 Handle items supplied by *Owner* at the *Place of the Work*, including uncrating and storage. Dispose of waste materials and debris.
 - .7 Take appropriate precautions to protect items supplied by *Owner* from loss or damage.
 - .8 Repair or replace items damaged at the *Place of the Work*.
 - .9 Assemble, install, connect, adjust, and finish items supplied by *Owner* as specified.
 - .10 Arrange for inspections required by authorities having jurisdiction as specified.

Summary of Work

- .11 Arrange for or perform testing as specified.
- .12 Workmanship warranty for installation.

1.8 Electronic Files

- .1 In the event that the *Contractor*, a *Subcontractor*, or a *Supplier* requests AutoCAD files from the *Consultant*, the *Consultant* will be allowed to use their discretion whether or not they will provide them. The *Consultant* will require an Electronic Document Transfer Agreement to be signed before issuance of AutoCAD files, in accordance with specimen agreement following this section.
- .2 The release of these electronic files by the *Consultant* does not imply transfer of copyright and ownership to the *Contractor*. The *Contractor* shall be responsible for all damages and liabilities resulting from the use of these files.

1.9 Seismic Design and Requirements

- .1 Design building components, assemblies and systems of the *Work*, as applicable, to meet seismic requirements pertinent to the location of the *Place of the Work* in accordance with the building code, and comply with requirements of jurisdictional authorities.
- .2 Post-Disaster Building: Conform to building code requirements for building classification, 'Post-Disaster Building'. Elements of structures, non-structural components and equipment shall be designed in accordance with building code requirements for seismic design, connections, and seismic restraint for 'Post-Disaster Buildings'.
- .3 Vibrating equipment shall receive seismically designed vibration isolation. Only non-vibrating equipment are permitted to be secured to the structure. Structural connection shall be by means of direct connection to the structure by bolting, using rigid seismic restraints, or taught cable restraints. Connection to structure shall occur only at locations capable of withstanding the forces applied.
- .4 The proposed connections and general design of *Products*, equipment and systems shall be described in shop drawing format with identification and location of forces imposed on the structure. The *Shop Drawings* shall be stamped by a Professional Engineer licensed to practice in the *Place of the Work* and have the appropriate understanding of the issues at hand. The *Shop Drawings* shall be submitted for review to the *Consultant* prior to putting the work in hand. The *Consultant* shall review these *Shop Drawings* for loads imposed on the structure.
- .5 Professional Engineer responsible for preparation of seismic engineered submittal shall review the *Work* and shall submit letters of general conformity for those parts of the *Work* in accordance with engineered submittal requirements of Section 01 33 00.

1.10 Performance of the Work

- .1 Work of this *Contract* once commenced at the *Place of the Work*, shall be completed within the shortest possible time, consistent with the *Contract* requirements.
- .2 Work of this *Contract* shall be organized as much as possible prior to commencement at the *Place of the Work*, and supplies of materials and *Products* shall be secured and deliveries of same scheduled including, in part, the supply and delivery of specially manufactured items, all to favour the expeditious performance of the *Work*.

Summary of Work

- .3 Work of this *Contract* shall not commence at the existing building until the *Contractor* has satisfied *Owner* and *Consultant* that *Products* and materials will be available at the time required for building into the *Work*, and that unavailability of *Products* and materials at the appropriate time will not prejudice the expeditious performance of the *Work*.
- .4 Areas immediately above, below and beyond the construction enclosures may contain required Mechanical and/or Electrical services, special rooms and highly sensitive research and/or equipment. These areas must be kept clean, free from dust, dirt, debris and waste construction materials.
- .5 Loose demolition, waste construction materials, new construction materials and *Products* shall therefore be transported beyond the construction enclosures in closed containers. Sweep clean closed containers of dust, dirt and debris before entering occupied areas. Provide construction waste management bins. Do not use *Owner's* waste management systems.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Allowances

PART 1 - GENERAL

1.1 Section Includes

- .1 Cash allowances.

1.2 Cash Allowances

- .1 Expenditure of cash allowances:
 - .1 The *Owner*, through the *Consultant*, will provide the *Contractor* with documentation required to permit pricing of a cash allowance item.
 - .2 The *Owner*, through the *Consultant*, may request the *Contractor* to disclose originals of all bids, quotations, and other price-related information received from potential *Suppliers* or *Subcontractors*.
 - .3 The *Owner*, through the *Consultant*, will determine by whom each cash allowance item will be performed and for what amount. Obtain *Owner's* prior written approval in the form of a *Change Order* before entering into a subcontract, amending an existing subcontract, or before performing by own forces, work that is covered by 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*.
- .2 Cash allowances are for supply and installation unless otherwise specified.
- .3 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.
- .4 Cash allowances for supply only:
 - .1 Amount of each cash allowance includes:
 - .1 Cost of *Products* as invoiced by the *Supplier*, including delivery and applicable taxes but excluding Value Added Taxes.
 - .2 Amount of each cash allowance does not include costs of the following items, which costs shall be included in the *Contract Price* and not in the cash allowance:
 - .1 Unloading, handling and storage at the *Place of the Work*.
 - .2 Installation and all other related costs.
- .5 Cash allowances for install only:
 - .1 Amount of each cash allowance includes:
 - .1 Unloading, storing, handling of *Products* at the *Place of the Work*.
 - .2 Installation, finishing, and commissioning of *Products*.
 - .3 Applicable taxes and duties (excluding Value Added Taxes).
 - .2 Amount of each cash allowance does not include costs of the following items, which costs shall be included in the *Contract Price* and not in the cash allowance:

Allowances

- .1 Net cost of *Products*.
- .2 Delivery to the *Place of the Work*.
- .6 Cash allowances for supply and install:
 - .1 Amount of each cash allowance includes:
 - .1 All costs to provide the specified *Products*, including supply, installation, and related costs, excluding Value Added Taxes.
 - .2 *Subcontractor's* and sub-*Subcontractor's* overheads and profits related to the cash allowance.
 - .7 Cash allowances for services:
 - .1 Amount of each cash allowance includes:
 - .1 All costs related to the services, excluding Value Added Taxes.
 - .2 *Subcontractor's* and sub-*Subcontractor's* overheads and profits related to the cash allowance.
 - .8 List of cash allowances
 - .1 The *Contract Price* includes cash allowances covering the following items:
 - .1 Commissioning: \$225,000.
 - .2 Independent inspection and testing soil, compaction, masonry and roofing: \$50,000.
 - .3 Soil remediation: \$30,000.
 - .4 Hazardous material abatement: \$125,000.
 - .5 Independent inspection and testing spray fireproofing: \$20,000.
 - .6 Independent inspection and testing glazing system: \$25,000.
 - .7 Concrete testing: \$15,000.
 - .8 Steel inspection: \$15,000.
 - .9 Unforeseeable asbestos and mould abatement: \$40,000.
 - .10 Sprinkler system on L1 service space: \$20,000.
 - .11 Small signage: \$5,000.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Substitution Procedures

PART 1 – GENERAL

1.1 Section Includes

- .1 Substitution procedures.
- .2 Submission requirements for proposed substitutions.

1.2 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.

1.3 Substitution Procedures

- .1 Proposals for substitutions of *Products* and materials must be submitted in accordance with procedures specified in this section.
- .2 *Contractor* may propose a Substitution wherever a *Product* or manufacturer is specified by proprietary name(s), unless there is accompanying language indicating that Substitutions will not be considered.
- .3 *Contractor* may propose a Substitution wherever a *Product* or manufacturer is specified by proprietary name(s) and accompanied by language such as "or equal", "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*.
- .4 Provided a proposed Substitution submission includes all of the information specified in this Section under Submission Requirements For Proposed Substitutions, *Consultant* may review submissions, if directed by *Owner*, but in any case with the understanding that the *Contract Time* will not be altered due to the time required by the *Consultant* to review the submission and by the *Contractor* to implement the substitution in the *Work*.
- .5 *Consultant* may recommend to *Owner* acceptance of a Substitution proposed by *Contractor* 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.
 - .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, neither *Consultant* nor *Owner* will consider that a valid reason to accept a Substitution.
- .7 If *Owner* accepts a Substitution, 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.

Substitution Procedures

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

1.4 Submission Requirements for Proposed Substitutions

- .1 Include with each proposed Substitution the following information:
- .1 Identification of the Substitution, including *Product* name and manufacturer's name, address, telephone numbers, and web site.
 - .2 Reason(s) for proposing the Substitution.
 - .3 A statement verifying that the Substitution will not affect the *Contract Price* and *Contract Time* or, if applicable, the amount and extent of a proposed increase or decrease in *Contract Price* and *Contract Time* on account of the Substitution.
 - .4 A statement verifying that the Substitution will not affect the performance or warranty of other parts of the *Work*.
 - .5 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.
 - .6 *Product* samples as applicable.
 - .7 A detailed comparison of the physical properties and performance characteristics of the specified *Product* and the Substitution, with any significant variations clearly highlighted.
 - .8 Availability of maintenance services and sources of replacement materials and parts for the Substitution, as applicable, including associated costs and time frames.
 - .9 If applicable, estimated life cycle cost savings resulting from the Substitution.
 - .10 Details of other projects and applications where the Substitution has been used.
 - .11 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.
 - .12 Confirmation of proposed substitution delivery, in writing by *Product* manufacturer.
 - .13 Compliance with the building codes and requirements of authorities having jurisdiction.
 - .14 Copy of manufacturer's warranty for any *Product* or system for which an extended warranty has been specified, along with copy of manufacturer's warranty for specified *Product* or system with differences highlighted.
- .2 Substitutions submitted on *Shop Drawings* without following requirements of this section prior to submission of the affected *Shop Drawings* will cause the *Shop Drawings* to be rejected.

Substitution Procedures

- .3 Proposed substitutions shall include costs associated with modifications necessary to other adjacent and connecting portions of the *Work*.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Contract Modification Procedures

PART 1 - GENERAL

1.1 Section Includes

- .1 Method of *Contract Price* adjustment - *Change Orders*.
- .2 *Change Order* procedures.
- .3 Method of *Contract Price* adjustment - *Change Directives*.
- .4 *Change Directive* procedures.
- .5 *Supplemental Instructions*.

1.2 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*.
 - .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.

1.3 Schedule of Equipment Rates

- .1 Prior to the first application for payment, submit for the *Consultant's* review a schedule of equipment rates for *Contractor* owned Construction Equipment.
- .2 Equipment rates shall reflect the rates that will be used when:

Contract Modification Procedures

- .1 Preparing price quotations for *Change Orders*.
- .2 Determining the cost of work attributable to *Change Directives*.
- .3 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.
- .4 Provide equipment rates for hourly, daily, weekly, and monthly use.
- .5 Obtain the *Owner's* written acceptance of the schedule of equipment rates before submitting the first *Change Order* quotation.
- .6 Accepted schedule of equipment 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 equipment rates if changes in local equipment rental market rates can be demonstrated. Obtain the *Owner's* written acceptance of such changes.

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 5 *Working Days* after receipt of the proposed change in the *Work*.
 - .2 If requested in the proposed change, provide a detailed breakdown of the price quotation including the following to the extent applicable, with appropriate supporting documentation:
 - .1 Estimated labour costs, including hours and applicable hourly rates based on the accepted schedule of labour rates.
 - .2 Estimated *Product* costs, including *Supplier* quotations, estimated quantities and unit prices.
 - .3 Estimated *Construction Equipment* costs.
 - .4 Enumeration of all other estimated costs included in the price quotation.
 - .5 Estimated credit amounts for labour and *Products* not required on account of the proposed change.
 - .6 Where applicable, *Subcontractor* quotations, also including a detailed breakdown of all of the above.
 - .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.

Contract Modification Procedures

- .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 in accordance with GC 6.1.9.
- .2 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* weekly, until the *Change Order* superseding the *Change Directive* is issued.

1.9 Fees for Overhead and Profit – *Change Directives*

- .1 The *Contractor's* entitlement to a fee for overhead and profit on the *Contractor's* expenditures and savings attributable to a *Change Directive* shall be in accordance with GC 6.1.9.
- .2 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.
- .3 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.

Contract Modification Procedures

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.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Payment Procedures

PART 1 - GENERAL

1.1 Section Includes

- .1 Schedule of values.
- .2 Cash flow projection.

1.2 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 acceptable to *Consultant* and *Owner* and that includes the following:
 - .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 based on *Contractor*, *Subcontractor*, and sub-*Subcontractor* work, systems description, Specification sections, or material and labour breakdown, as appropriate.
 - .3 Provisions for approved unit price work, assignable contracts, *Change Orders*, and allowances, 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.

Payment Procedures

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

1.3 Cash Flow Projection

- .1 Within 2 weeks from date of award of *Contract* unless otherwise specified herein, submit, for *Consultant's* review, a forecast of approximate monthly progress payments for each month of the *Contract Time*.
- .2 Prepare a cost breakdown for each section of the *Work* coordinated with the progress schedule.
- .3 Submit revised cash flow forecasts monthly. Submit additional revised cash flow forecasts when there are significant changes in rate of progress of the *Work* or significant changes in the *Contract Price* as determined by the *Consultant*. Submit additional revised cash flow forecasts when requested by *Consultant*.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Project Management and Coordination

PART 1 - GENERAL

1.1 Section Includes

- .1 Building dimension, templates, built-ins, and coordination.
- .2 Coordination and interference drawings.
- .3 Superintendent.
- .4 Discrepancies and clarifications.
- .5 Request for information (RFI) procedures.

1.2 Building Dimension, Templates, Built-ins, and Coordination

- .1 Take necessary dimensions for the proper execution of the *Work*. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.
- .2 Verify dimensions at the *Place of the Work* before commencing *Shop Drawings*. Before fabrication commences report discrepancies to *Consultant* in writing. Incorporate accepted variances on shop drawings and as-built records.
- .3 Supply forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the *Work* and set in place or instruct separate *Subcontractors* as to their location.
- .4 Supply items to be built in, as and when required together with templates, measurements, shop drawings and other related information and assistance.
- .5 Pay the cost of extra work and make up time lost as a result of failure to provide necessary information and items to be built in.
- .6 Verify that the *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 *Contract Documents*, and ensure that work installed in error is rectified before construction resumes.
- .7 Check and verify dimensions referring to interfacing of services. Verify such dimensions with interconnected portions of the *Work*.
- .8 Do not scale directly from drawings. Obtain clarification from *Consultant* if there is ambiguity or lack of information.
- .9 Details and measurements of any work which is to fit or to conform with work installed shall be taken at the *Place of the Work*.
- .10 Prepare and submit setting drawings, templates and other information necessary for the location and installation of material, holes, sleeves, inserts, anchors, accessories, fastenings, connections and access panels.
- .11 *Subcontractors* shall direct related *Subcontractors* on site of specific locations required for sleeves and openings.

Project Management and Coordination

1.3 Coordination and Interference Drawings

- .1 The *Contractor* shall be responsible for preparing and submitting to the *Consultant* for review, a consolidated set of installation coordination/interference drawings for the building showing how the building systems (including, but not limited to, domestic heating and cooling piping, air distribution systems, air control boxes, reheat coils, fire protection piping, electrical distribution, fire alarm systems, lighting, communication cabling, security cabling) will fit together above ceiling areas and in exposed ceiling, to allow ceiling heights required by the *Contract Documents* and by maintenance and control access.
 - .1 Each *Subcontractor* whose work is affected by the information presented on the coordination and interference drawings shall sign-off on the drawings prior to submission to the *Consultant* and thereby agrees to coordinate their parts of the *Work* to preserve the coordination and interference guidelines represented by the coordination and interference drawings.
- .2 Prepare sleeve drawings for Mechanical and Electrical work of showing size and location of penetrations through load bearing elements. Submit sleeving drawings in electronic form to *Consultant* for review not less than 10 *Working Days* prior to construction of affected work.
- .3 Prepare embedded conduit drawings, showing size and location of penetrations through load bearing elements. Submit embedded conduit drawings in electronic form to *Consultant* for review not less than 10 *Working Days* prior to construction of affected work.
- .4 Prepare insert setting drawings for work to be cast into concrete and/or mortared into masonry elements. Submit insert setting drawings in electronic form to *Consultant* for review not less than 10 *Working Days* prior to construction of affected work.
- .5 Coordinate placement of equipment to ensure that components will be properly accommodated within spaces provided prior to commencement of *Work*. In areas where equipment and services are exposed care shall be taken to organize and layout services in an organized and orderly manner. Where possible services are to run parallel or at right angles to one another as required. *Consultant* may request that service layout be reconfigured to suit sightline concerns during the coordination drawings review phase. These drawing changes are to be executed at no additional cost to the *Owner*.
- .6 Take complete responsibility for remedial work that results from failure to coordinate the *Work* prior to fabrication and installation.
- .7 Ensure that accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment are *Provided* in layout of equipment and services.
 - .1 Indicate required access points, clearances, and sizes for equipment and pieces of equipment required in the *Work*. Note areas where access is compromised by interferences with other services for review by the *Consultant*. Do not proceed with installation of equipment in such compromised areas until a proposed means of providing access has been accepted by the *Consultant*.
- .8 Prepare and circulate coordination, interference and sleeving drawings prior to placing orders for equipment and materials.

Project Management and Coordination

- .9 Coordination and interference drawings shall be circulated for mark-ups by *Subcontractors* responsible for work of Divisions 3, 5, 6, 9, 11, Mechanical and Electrical work, as applicable.
- .10 Coordinate preparation and submission of coordination and interference drawings with shop drawings.
- .11 Show cross sections in key areas, as required, and as defined by *Consultant*. Show re-bar, structural elements, piping, air handling and heating systems distribution, sprinkler system distribution, lighting, gypsum board wall and ceiling assemblies, acoustical isolation, *Products* and systems involving life safety, conveying systems, electrical distribution.
- .12 Show ductwork as 2 lines. Show cross sections in key areas, as required, and as directed by *Consultant*. Show re-bar, structural elements, air handling and heating systems distribution, gypsum board wall and ceiling assemblies, acoustical isolation, *Products* and systems involving life safety, conveying systems, and electrical distribution.
- .13 Coordination and interference drawings shall be produced in uniform scale on media that will allow overlays to be assembled. Upon incorporation of details, drawings shall be submitted to *Consultant* for review. Areas of conflict or interference shall be resolved in a mutually agreed manner between *Subcontractors* and resubmitted on coordination and interference drawings until accepted by *Consultant*.

1.4 Superintendent

- .1 Provide superintendent and necessary supporting staff personnel who shall be in attendance at the *Place of the Work* while *Work* is being performed, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.
- .2 The *Contractor* shall appoint superintendent at the *Place of the Work* who shall have overall authority at the *Place of the Work* and shall speak for the *Contractor* and represent the *Contractor's* interest and responsibilities at meetings at the *Place of the Work* and in dealings with the *Consultant* and the *Owner*.

1.5 Discrepancies and Clarifications

- .1 Advise *Consultant* of discrepancies discovered in requirements of the *Contract Documents* and request clarification in written form.
- .2 Advise *Consultant* when clarifications are required pertaining to meaning or intent of requirements of *Contract Documents* and request clarification from *Consultant* in written form.
- .3 Do not proceed with related work until written clarification is provided by *Consultant*.
- .4 Failure to notify *Consultant* shall result in *Contractor* incurring responsibility for resulting deficiencies and expense at no additional cost to the *Owner*.
- .5 Written requirements issued by *Consultant* for the purpose of clarification, implicitly supersede applicable and relevant aspects of the *Contract Documents* irrespective of whether or not these documents are explicitly or specifically cited in clarification requests or clarification requirements.

Project Management and Coordination

1.6 Request for Information - RFI

- .1 A Request for Information (RFI) is a formal process used during the *Work* to obtain an interpretation of the *Contract Documents* pursuant to GC 2.2.6 through GC 2.2.9 (inclusive).
 - .1 An RFI shall not constitute notice of claim for a delay.
- .2 Submittal procedures:
 - .1 RFI form:
 - .1 Submit RFI on "Request for Information" in form acceptable to the *Consultant*, an example of which is appended to this section. The *Consultant* shall not respond to an RFI except as submitted on this form.
 - .2 Where RFI form does not provide sufficient space for complete information to be provided thereon, attach additional sheets as required.
 - .3 Submit with RFI form necessary supporting documentation.
 - .2 Submit RFI form as follows:
 - .1 1 copy digitally in pdf format to *Consultant* using the *Consultant's* document management system.
 - .1 Refer to Section 01 10 00 "Electronic Files" paragraph.
 - .2 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 this will not be paid by the *Owner*.
 - .3 RFIs shall be submitted only to the *Consultant*.
 - .4 RFIs shall be submitted only by *Contractor*. RFIs submitted by *Subcontractors* or *Suppliers* shall not be accepted.
 - .5 Number RFIs consecutively in one sequence in order submitted.
 - .6 Submit one distinct RFI per RFI form.
 - .3 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 progress draw submittal.
 - .4 *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.
 - .5 Allow 5 *Working Days* for review of each RFI by the *Consultant*.

Project Management and Coordination

- .1 *Consultant's* review of RFI commences on date of receipt by the *Consultant* of RFI submittal and extends to date RFI returned by *Consultant*.
- .2 When the RFI submittal is received by *Consultant* before noon, review period commences that day; when RFI submittal is received by *Consultant* after noon, review period begins on the next *Working Day*.
- .3 If, at any time, the *Contractor* submits a large enough number of RFIs such that the *Consultant* cannot process these RFIs within 5 *Working Days*, the *Consultant*, will confer with the *Contractor* within 1 *Working Day* of receipt of such RFIs, and the *Consultant* and the *Contractor* will jointly prepare an estimate of the time necessary for processing same as well as an order of priority between the RFIs submitted. The *Contractor* shall accommodate such necessary time at no increase in the *Contract Time* and at no additional cost to the *Owner*.
- .6 Undertake a review of the *Contract Documents* to determine that the matter in question relating to the interpretation of the *Contract Documents* cannot be resolved by direct reference to the *Contract Documents*. Describe this review in detail on the RFI form. RFI submittals that lack a detailed review description, or where the detail provided is insufficient, in the sole opinion of the *Consultant*, shall not be reviewed by the *Consultant* and shall be rejected.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Contractor's Request for Interpretation

Consultant's Supplemental Instructions

Date	# of Pages
To	From
Co.	Co.
Phone #	Phone #
Fax #	Fax #
Email	Email

Project:	_____	RFI No.:	_____
Owner:	_____	Date of Request:	_____
To:	_____	Contractor:	_____
	(Consultant's Representative)		
Project No.:	_____	Contractor's Representative:	_____
Consultant's Fax No.:	_____	Fax No.:	_____

Interpretation Requested: (Description of request for interpretation and references to relevant portions of *Contract Documents*)

Attachments: _____

Requested by: _____

Consultant's Supplemental Instruction:

Attachments: _____

Reply By: _____

The work shall be carried out in accordance with these *Supplemental Instructions* issued in accordance with the *Contract Documents* without change in *Contract Price* or *Contract Time*. Prior to proceeding with these instructions, indicate acceptance of these instructions as being consistent with the *Contract Documents* by returning a signed copy to the *Consultant*.

Supplemental Instruction Issued:	Supplemental Instruction Accepted:
By:	By:
_____ Consultant	_____ Contractor
_____ Date	_____ Date
Cc: <input type="checkbox"/> Owner <input type="checkbox"/> Consultant <input type="checkbox"/> Contractor <input type="checkbox"/> Field <input type="checkbox"/> Other:	

Mechanical and Electrical Coordination

PART 1 - GENERAL

1.1 General

- .1 The work of this Section shall include for coordination between mechanical and electrical work, and mechanical and electrical relationship with the work of other Sections.

1.2 Mechanical and Electrical Work Coordinator

- .1 The mechanical and electrical work coordinator shall be arranged by and paid for by the *Contractor* and shall be a person or firm technically qualified and experienced in field coordination for the type of mechanical and electrical work required for this *Project*. The mechanical and electrical work managers shall have minimum 10 years field experience working on hospital projects.

1.3 Submittals

- .1 Submit coordination drawings and schedules prior to shop drawings, product data, and samples.

1.4 Coordination

- .1 Conduct regular meetings with all related *Subcontractors*, and other concerned parties as necessary to establish and maintain coordination and scheduling, and to resolve any matters in dispute.
- .2 Participate in progress meetings. Report on progress of work to be adjusted under coordination requirements, and any needed changes in schedules.
- .3 Transmit minutes of meetings to concerned parties.

1.5 Coordination Documents

- .1 Prepare coordination drawings of installation for efficient use of available space, for proper sequence of work, and to resolve conflicts.
- .2 Prepare master schedule to record responsibilities under each Section of Divisions 01 through each of the specifications of actions which directly relate to mechanical and electrical work.
- .3 Maintain documents throughout construction period, recording changes due to modifications and adjustments.
- .4 After acceptance of original and revised documents, reproduce and distribute copies to each concerned party.
- .5 Prepare facility shutdown schedule and submit to *Owner*.

1.6 Coordination of Submittals

- .1 Review shop drawings, product data, and samples for compliance with *Contract Documents* and for coordination of work of all Sections of the specifications, prior to submitting to *Consultant*, in accordance with Section 01 33 00. Coordination includes but is not limited to:

Mechanical and Electrical Coordination

- .1 Check field dimensions and clearances, relation to available spaces, and anchor bolt settings.
- .2 Check compatibility with equipment and work of other sections, electrical characteristics, and control requirements.
- .3 Check motor voltages and control characteristics.
- .4 Coordinate controls and interlocks, voltages and wiring of pneumatic switches, and relays.
- .5 Coordinate locations of mechanical and electrical ceiling access panels in Integrated Ceiling system and other suspended ceilings.
- .6 Coordinate locations of mechanical and electrical ceiling access panels in Integrated Ceiling system and other suspended ceilings.
- .7 Review the effect of any changes on work of other Sections.
- .8 Verify and coordinate maintenance of Record Documents.

1.7 Coordination of Substitutions and Modifications

- .1 Review proposals and requests from *Subcontractors*. Check for compliance with *Contract Documents* and for compatibility with work and equipment of other Sections.

1.8 Observation of Work

- .1 Observe *Work* for compliance with *Contract Documents*.
- .2 Maintain a list of observed deficiencies and defects; promptly submit to *Consultant*.

1.9 Documentation

- .1 Observe and maintain a record of tests; record:
 - .1 Specifications Section number, product or equipment, and name of *Subcontractor*.
 - .2 Testing agency and name of inspector.
 - .3 Name of manufacturer's representative present.
 - .4 Date, time, and duration of tests.
 - .5 Type of test, and results.
 - .6 Retesting required.

1.10 Equipment Start-Up

- .1 Observe and participate in equipment start-up and adjustments; record time and date of start-up, and results.
- .2 Observe and participate in equipment start-up and adjustments; record time and date of start-up, and results.
- .3 Observe and participate in all equipment demonstrations to the *Owner*; record times and record additional information required in Operation and Maintenance Manuals.

Mechanical and Electrical Coordination

1.11 Inspection and Acceptance of Equipment

- .1 Prior to inspection, verify that equipment is tested and operational, clean, and in specified condition.
- .2 Assist with the *Consultant's* inspections and prepare list of items to be completed or corrected.

1.12 Commissioning

- .1 Coordinate the commissioning requirements for the architectural, mechanical and electrical Divisions. Prepare a commissioning schedule for each Division. Issue all completed test forms to the *Consultant* on a monthly basis.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Project Meetings

PART 1 - GENERAL

1.1 Section Includes

- .1 Project meeting requirements.

1.2 Administrative

- .1 Except for the Pre-Construction Meeting, the *Contractor* shall schedule meetings as specified herein.
 - .1 Such scheduling shall be in consultation both with the *Owner* and with the *Consultant*.
- .2 Except for the Pre-Construction Meeting, the *Contractor* shall prepare agendas for meetings specified herein.
 - .1 Agendas shall include, as a minimum, the agenda items specified in the *Contract Documents*.
- .3 The *Contractor* shall distribute written notice of each meeting specified herein, unless specified otherwise, complete with meeting agenda, 5 *Working Days* in advance of meeting date to the *Consultant* and the *Owner* and other affected parties.
- .4 Except for the Pre-Construction Meeting, the *Contractor* shall chair and record the minutes of meetings specified herein.
 - .1 *Contractor* shall distribute copies of minutes to the *Owner*, the *Consultant*, and all others in attendance within 3 *Working Days* after date of meeting.
- .5 Representatives of parties attending meetings shall be authorized to act on behalf of the parties they represent.
- .6 *Subcontractors* and *Suppliers* shall attend meetings only when directed by the *Consultant*, or when specifically called for in the *Contract Documents*.
- .7 The *Contractor* shall prepare, and distribute to the *Consultant* and the *Owner* 4 days in advance of next progress meeting date, the following:
 - .1 Monthly progress reports containing updated construction schedule, submittal logs, requests for interpretation logs, and budget.

1.3 Pre-Construction Meeting

- .1 After award of *Contract*, the *Consultant* will arrange a meeting of parties to *Contract* to discuss and resolve administrative procedures and responsibilities.
- .2 *Consultant* will invite the *Owner*, Sub-consultants, and *Contractor*.
- .3 *Consultant* will chair the meeting and will document the responsibilities and necessary activities of the participants during construction as discussed, and distribute minutes of meeting to each participant.
- .4 Attendees at *Contract* start-up meeting shall include the following:
 - .1 *Contractor*.

Project Meetings

- .2 *Contractor's* site superintendent(s).
- .3 *Consultant*.
- .4 *Owner*.
- .5 Infection control representative.
- .6 Mechanical *Subcontractor*.
- .7 Electrical *Subcontractor*.
- .8 *Integrated testing coordinator*.
- .9 Independent inspection and testing company.
- .10 Representatives of other organizations whose coordination is required during construction.
- .5 Agenda
 - .1 *Owner's* guidelines and policies.
 - .2 Appointment of official representative of participants in the *Project*.
 - .3 Status of permits, fees and requirement of authorities having jurisdiction. Action required.
 - .4 Establishing a schedule for progress meetings.
 - .5 Review of work sequence and *Stages of the Work*.
 - .6 Requirements for *Contract* modification and interpretation procedures, including, but not limited to: requests for interpretation, contemplated change orders, *Change Orders*, *Change Directives*, *Supplemental Instructions*, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 - .7 Submittal requirements and procedures.
 - .8 Schedule of submission of samples, colour chips, and items for *Owner's* and/or *Consultant's* consideration.
 - .9 Construction schedule and progress scheduling.
 - .10 Delivery schedule of specified equipment.
 - .11 Requirements for infection prevention and control.
 - .12 Appointment of independent inspection and testing agencies or firms.
 - .13 Requirements for notification for reviews. Allow a minimum of 48 hours' notice to *Consultant* for review of the *Work*.
 - .14 Requirements for *Temporary Work*.
 - .15 Requirements for firestopping coordination and preparation of firestopping manual (refer to Section 01 33 00).
 - .16 Security requirements at and for the *Place of the Work*.
 - .17 *Owner* supplied *Products*.

Project Meetings

- .18 Integrated fire protection and life safety systems testing requirements and procedures (refer to Section 01 91 26).
- .19 Review of waste management and disposal procedures and requirements.
- .20 As-built documents.
- .21 Operation and maintenance manuals.
- .22 Take-over procedures, acceptance, warranties.
- .23 Publication to be used for publishing certificate of substantial performance.
- .24 Progress claims, administrative procedures, holdbacks.
- .25 Insurances, transcripts of policies.
- .26 *Contractor's* safety procedures.
- .27 Certificate of Clearance from the Workplace Safety and Insurance Board (WSIB).

1.4 Pre-Installation Meetings

- .1 During the course of the *Work* prior to *Substantial Performance of the Work*, schedule pre-installation meetings as required by the *Contract Documents* and coordinated with the *Consultant*.
- .2 As far as possible, pre-installation meetings shall be scheduled to take place on the same day as regularly scheduled progress meetings.
- .3 Attendees at pre-installation meetings shall include the following:
 - .1 *Contractor*.
 - .2 *Subcontractors* affected by the work for which the pre-installation meeting is being conducted.
 - .3 *Consultant*.
 - .4 Infection control representative.
 - .5 Manufacturer's representatives, as applicable.
 - .6 Independent inspection and testing company, as applicable.
- .4 Agenda to include the following:
 - .1 *Owner's* guidelines and policies.
 - .2 Appointment of official representatives of participants in the *Project*.
 - .3 Review of existing conditions and affected work, and testing thereof as required.
 - .4 Review of installation procedures and requirements.
 - .5 Review of environmental and site condition requirements.
 - .6 Review of infection prevention and control procedures.
 - .7 Schedule of the applicable portions of the *Work*.
 - .8 Schedule of submission of submittals, samples, mock-ups, and items for *Consultant's* consideration.

Project Meetings

- .9 Requirements for *Temporary Work*.
- .10 Requirements for notification for reviews. Allow a minimum of 48 hours' notice to *Consultant* for review of the *Work*.
- .11 Requirements for inspections and tests, as applicable. Schedule and undertake inspections and tests.
- .12 Delivery schedule of specified equipment.
- .13 Special safety requirements and procedures.
- .14 Publication to be used for publishing certificate of substantial performance.

1.5 Progress Meetings

- .1 During the course of the *Work* prior to *Substantial Performance of the Work*, schedule regular progress meetings. Submit proposed schedule of site meetings to *Consultant*.
- .2 Attendees at progress meetings shall include the following:
 - .1 *Contractor*.
 - .2 *Contractor's* site superintendent(s).
 - .3 *Consultant*.
 - .4 *Owner*.
- .3 Agenda to include the following:
 - .1 *Owner's* guidelines and policies.
 - .2 Review, approval of proceedings of previous meeting.
 - .3 Review of items arising from proceedings.
 - .4 Review of progress of the *Work* since previous meeting and *Contractor's* monthly progress report.
 - .5 Field observations, problems, conflicts.
 - .6 Update construction schedule.
 - .7 Problems that impede compliance with construction schedule.
 - .8 Review of off-site fabrication delivery schedules.
 - .9 Review material delivery dates/schedule.
 - .10 Corrective measures and procedures to regain construction schedule.
 - .11 Revisions to construction schedule.
 - .12 Progress, schedule, during subsequent period of the *Work*.
 - .13 Review submittal schedules.
 - .14 Review status of submittals.
 - .15 Review of infection prevention and control procedures.
 - .16 Maintenance of quality standards.

Project Meetings

- .17 Pending changes and substitutions.
- .18 Review of *Contract* modifications and interpretations including, but not limited to: requests for interpretation and log, contemplated change orders, *Change Orders*, *Change Directives*, and *Supplemental Instructions* for effect on construction schedule and on *Contract Time*.
- .19 Review of status of as-built documents.
- .20 Other business.

1.6 Pre-Takeover Meeting

- .1 Prior to application for *Substantial Performance of the Work*, schedule a pre-takeover meeting.
- .2 Agenda to include the following:
 - .1 Review, approval of proceedings of previous meeting.
 - .2 Review of items arising from proceedings.
 - .3 Review of procedures for *Substantial Performance of the Work*, completion of the *Contract*, and handover of the *Work*.
 - .4 Field observations, problems, conflicts.
 - .5 Review of outstanding *Contract* modifications and interpretations including, but not limited to: requests for interpretation and log, contemplated change orders, *Change Orders*, *Change Directives*, and *Supplemental Instructions* for effect on construction schedule and on *Contract Time*.
 - .6 Problems which impede *Substantial Performance of the Work*.
 - .7 Review of procedures for deficiency review. Corrective measures required.
 - .8 Review of arrangements for hydro, heating, and other services.
 - .9 Review of integrated fire protection and life safety systems testing requirements and procedures (refer to Section 01 91 26).
 - .10 Progress, schedule, during succeeding period of the *Work*.
 - .11 Review submittal requirements for warranties, manuals, and all demonstrations and documentation required for *Substantial Performance of the Work*.
 - .12 Review of keying and hardware requirements.
 - .13 Review of status of as-built documents and record drawings.
 - .14 Status of commissioning and training.
 - .15 Review *Contractor's* deficiency list and status.
 - .16 Cleaning for occupancy.
 - .17 Other business.

Project Meetings

1.7 Post-Construction Meeting

- .1 Prior to application for completion of *Contract*, schedule a post-construction meeting. 5 *Working Days* prior to date for meeting, *Consultant* shall confirm a date for meeting based on evaluation of completion requirements.
- .2 Agenda to include the following:
 - .1 Review, approval of proceedings of previous meeting.
 - .2 Confirmation that no business is arising from proceedings.
 - .3 Confirmation of completion of the *Contract*, and handover of reviewed documentation from the *Consultant* to the *Owner*.
 - .4 Confirmation of completion of contemplated change orders, *Change Orders*, *Change Directives*, and *Supplemental Instructions*.
 - .5 Problems that impede *Contract* completion.
 - .6 Identify unresolved issues or potential warranty problems.
 - .7 Confirmation of completion of deficiencies.
 - .8 Corrective measures required.
 - .9 Confirmation of arrangements for hydro, heating and other services.
 - .10 Confirm submittal requirements for warranties, manuals, and demonstrations and documentation for *Contract* completion are in order.
 - .11 Review of procedures for communication during post-construction period.
 - .12 Handover of reviewed record documents by the *Contractor* to the *Owner*.
 - .13 Submission of final application for payment.
 - .14 Review and finalize outstanding claims, pricing, and allowance amounts.
 - .15 Status of commissioning and training.
 - .16 Demobilization and the *Place of the Work* restoration.
 - .17 Review of requests for interpretation log.
 - .18 Other business.

1.8 Special Meetings

- .1 *Owner* and/or *Consultant* reserves the right to require special meetings which may be held on short notice and at which attendance by *Contractor* and representatives of affected *Subcontractors* and *Suppliers* is mandatory. *Contractor* shall keep detailed and accurate meeting notes and distribute copies within 3 *Working Days* to all in attendance and those affected by agreements made at such meetings.

PART 2 - PRODUCTS

Not applicable.

Project Meetings

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Construction Progress Documentation

PART 1 - GENERAL

1.1 Section includes

- .1 Construction progress schedule.
- .2 Work plan.
- .3 Submittals schedule.
- .4 Inspection and testing schedule.
- .5 Recording actual site conditions on as-built documents.
- .6 Schedule management.
- .7 Digital photographs.

1.2 Summary

- .1 This Section specifies *Contractor's* responsibilities for preparation and submission of schedules and other documentation related to tracking construction progress.
- .2 The schedule shall:
 - .1 Show actual progress versus planned progress.
 - .2 Demonstrate that scheduling issues are being proactively identified and addressed in a timely manner, and that planned progress is being maintained as closely as possible.

1.3 Schedule Format

- .1 Construction Schedule shall to be developed utilizing Microsoft Project or Primavera Project Planner
- .2 Include horizontal time scale identifying the first *Working Day* of each week.
- .3 Include a separate bar for each trade, work package, or operation.
- .4 Format for listings: The chronological order of the start of each item or part of the *Work*.
- .5 Identification of listings: By systems description.

1.4 Construction Progress Schedule

- .1 Format and content:
 - .1 Include the complete sequence of construction activities, including provision for climate and weather.
 - .2 Provide a work breakdown structure identifying key activities, work packages, and major milestones at a sufficient level of detail to effectively manage construction progress, including:
 - .1 Long delivery *Products*.
 - .2 Dates for the commencement and completion of inspection and testing.
 - .3 Preparation and review of mock-ups.
 - .4 *Owner* decisions for cash allowances.

Construction Progress Documentation

- .5 Shutdown or closure activities.
- .6 Delivery of items supplied by *Owner*.
- .7 *Owner* performed work.
- .8 Demonstration and training activities.
- .9 Dates for the commencement and completion of each major element of the *Work* parallel to the sections of the specifications.
- .10 Dates for *Ready-for-Takeover* and *Substantial Performance of the Work*.
- .11 Dates for delivery of *Products*, equipment, finish items, factory-finished manufactured items. Show last dates for order, shipment, and delivery in order to meet construction schedule.
- .3 Show projected percentage of completion for each item as of the first *Working Day* of each week.
- .2 Submission:
 - .1 Submit initial schedule to *Owner* and *Consultant* within 10 *Working Days* after *Contract* award.
 - .2 Submit schedule in pdf format to *Consultant* using the *Consultant's* document management system.
 - .3 *Consultant* will review format and content of initial schedule and request necessary changes, if any, within 7 *Working Days* after receipt.
 - .4 If changes are required, resubmit finalized initial schedule within 5 *Working Days* after return of review copy.
 - .5 Submit updated progress schedule to *Owner* and *Consultant* at each regularly scheduled progress meeting in accordance with Section 01 31 19. In addition to requirements specified in Section 01 32 00 for each submission of construction schedule, include a written report on the activities completed in the week preceding the progress meeting, and a summary indicating the activities planned to be undertaken in the 2 weeks subsequent to the progress meeting, including human resource loading.
 - .6 Submit updated progress schedule to *Owner* and *Consultant* with each application for progress payment, indicating actual and projected start and finish dates with report date line and progress. Submit more frequently if requested by *Owner* or *Consultant*.
 - .7 At each date of submission of construction schedule, indicate progress of each activity.
 - .1 Show changes occurring since previous submission of the construction schedule:
 - .1 Major changes in scope.
 - .2 *Change Orders* and *Change Directives*.
 - .3 Activities modified since previous submission.
 - .4 Revised projections of progress and completion.
 - .5 Other identifiable changes.

Construction Progress Documentation

- .2 Include a narrative report to define:
 - .1 Problem areas, anticipated delays, and the impact on the schedule.
 - .2 Corrective action recommended and its impact on the schedule.
- .3 Include cash flow projection with minimum look ahead as directed by the *Consultant*.
- .4 Include look ahead schedule to identify noisy work, delivery time of equipment and coordination with *Owner* occupied spaces. Review and update on a bi weekly basis. Ensure that schedule includes but is not limited to all work involving *Owner* coordination and work to be completed prior to delivery of equipment.

1.5 Submittals Schedule

- .1 Format and content:
 - .1 Prepare a detailed schedule of submittals required by the *Contract Documents*, including samples required for testing, and including those for items supplied by *Owner*.
 - .2 Provide a separate line for each required submittal, organized by *Specifications* section names and numbers, and further broken down by individual *Products* and systems as required.
 - .3 Indicate dates for submitting, review time, resubmission time, float time, and last date for meeting construction schedule.
 - .4 Schedule submissions of submittals well in advance of scheduled dates for installation, to provide lead time for reviews and possible resubmissions and for placing orders and securing delivery so as to avoid delays in the *Work*.
 - .5 Make provisions in schedule for at least 10 *Working Days* for *Consultant's* review of submittals. When submittals have to be reviewed by one or more of *Consultant's* subconsultants, add 5 more *Working Days* for a total 15 *Working Days* review period.
 - .6 If the *Consultant* requires resubmission of submittals, allow for an additional 10 *Working Days* review for each resubmission.
 - .7 If, at any time, the *Contractor* submits a large enough number of submittals such that the *Consultant* cannot process these submittals within 10 *Working Days*, the *Consultant*, in consultation with the *Contractor* within 3 *Working Days* of receipt of such submittal, will provide the *Contractor* with an estimate of the time necessary for processing same. The *Contractor* shall accommodate such necessary time at no increase in the *Contract Time* and at no additional cost to the *Owner*.
 - .8 Changes in the construction schedule shall maintain the minimum review periods for the *Consultant's* review specified above.
- .2 Submission:
 - .1 Submit initial schedule to *Consultant* within 15 *Working Days* after *Contract* award.
 - .2 Submit schedule in pdf format to *Consultant* using the *Consultant's* document management system.

Construction Progress Documentation

- .3 *Consultant* will review format and content of initial schedule and request necessary changes, if any, within 10 *Working Days* after receipt.
- .4 *Consultant* will review submittal schedule and advise *Contractor* if volume and timing of submittals will permit review of and response to submittals within timeframes specified under Section 01 32 00. *Consultant* may require modifications to submittals schedule in order to allow adequate time for review of submittals. Adjust submittals schedule and construction schedule as required to comply with *Consultant's* needs.
- .5 If changes are required, resubmit finalized schedule within 5 *Working Days* after return of review copy.
- .6 Submit updated submittals schedule monthly to the *Consultant* or more frequently as directed by the *Consultant*.
- .7 Schedule shall be accompanied by a checklist, correlated to each of the schedule of submittals, the construction schedule, and the schedule of inspections and tests, listing the following:
 - .1 *Shop Drawings*.
 - .2 Samples.
 - .3 Mock-ups.
 - .4 Reviews, tests and inspections by:
 - .1 Manufacturers.
 - .2 Authorities having jurisdiction.
 - .3 The *Owner*.
 - .4 The *Consultant*.
 - .5 Independent inspection and testing companies.
 - .5 Demonstration and training.

1.6 Inspection and Testing Schedule

- .1 Prepare schedule for inspection and testing by advance discussion with the selected independent inspection and testing company to determine the time required for the independent inspection and testing company to perform its tests and to issue each of its findings, and allow for required time in the construction schedule.
- .2 Refer to Section 01 45 00 for additional requirements for inspection and testing scheduling.

1.7 Schedule Management

- .1 A schedule submitted as specified and accepted by *Consultant* shall become the baseline schedule and shall be used as the baseline for updates.
- .2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with *Consultant* and *Owner*, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.

Construction Progress Documentation

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

1.8 Recording Actual Site Conditions on As-Built Documents

- .1 *Owner* will provide 1 set of *Contract Documents* to the *Contractor* for as-built documentation purposes. Record information and maintain as-built documents in clean, dry and legible condition.
- .2 Clearly label each drawing as “AS-BUILT DRAWING” and each specification “AS-BUILT SPECIFICATION” and each schedule “AS-BUILT SCHEDULE”. Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .3 Accurately document as-built conditions and deviations from *Contract Documents* as the *Work* progresses.
- .4 Mark changes in red ink.
- .5 Document actual construction including:
 - .1 Changes by *Change Orders*, *Change Directives*, and *Supplemental Instructions*.
 - .2 References to *Shop Drawings*, where *Shop Drawings* show more detail.
 - .3 Locations of interior mechanical and electrical equipment and distribution.
 - .4 In specification as-builts: Document as-built *Products*, including manufacturer, manufacturer’s model or system number.
- .6 Do not use as-built drawings for construction purposes.

1.9 Digital Photographs

- .1 Provide photographic documentation in digital format and in accordance with procedures and submission requirements specified in this section.
 - .1 No other photographs of the *Place of the Work* or of any portion of the *Work* will be permitted without written approval of the *Owner*.
- .2 Equipment: Provide photographs using minimum 10 megapixel digital camera.
- .3 Submit the required photographs to the *Consultant* and to the *Owner*.
- .4 Output: Supply date stamped maximum resolution colour photos to *Consultant* in JPEG format digitally.
- .5 Number of photos required:
 - .1 Prior to construction: Provide necessary number of photographs, as required to document existing conditions and verify damage to adjacent streets and property that may have existed prior to construction or demolition work: Minimum 50 photos.
 - .2 Each Progress draw: Provide 24 construction photographs each month to accompany each application for progress draw to document the stage of the *Work* from points selected by the *Consultant* showing as much as possible of the *Work* installed during the previous month.
 - .3 Provide minimum of 8 photographs on each meeting report and for each progress meeting.

Construction Progress Documentation

- .4 Completion: When the *Work* is completed, arrange to take final photographs of the *Work* from a minimum of 8 points of view.

1.10 Progress and Weekly Reports

- .1 Progress reports:
 - .1 Submit to the *Consultant* and *Owner*, progress reports coincident with Progress meetings and with each progress payment claim consisting of a concise description and a marked-up schedule showing physical percentage complete by item and in total.
- .2 Weekly reports:
 - .1 Maintain in the field office at the *Place of the Work* a written weekly record of the progress of parts of the *Work* available. Show dates of commencement and completion of parts of the *Work*, number of people engaged on the *Work* (including sub-trades) broken down in groups for each part of the *Work*.

1.11 Reporting and Communication

- .1 The communication system proposed for communicating with *Consultant* and *Owner* will be subject to the Consultants and *Owner's* approval.
- .2 Notwithstanding the communication system utilized by the *Contractor* for day to day communication with the *Consultant*, the *Contractor* is required to submit to the *Consultant* a monthly report by no later than the 5th working day of each month.
- .3 The report shall provide a detailed status of the project including schedule, status of RFI's, SI's, CCN's and all outstanding issues.
- .4 This data, as well as minutes of all meetings, will be provided in electronic format. All data must be fully accessible (not in read only format).
- .5 Include costs, license fees etc. associated with using communication system.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Submittal Procedures

PART 1 - GENERAL

1.1 Section Includes

- .1 Administrative requirements.
- .2 Submission procedures.
- .3 Certificates and Certification Submittals
- .4 *Product* data sheets.
- .5 *Shop Drawings*.
- .6 Engineered Judgements.
- .7 Project firestopping manual and coordination.
- .8 Samples.

1.2 Administrative Requirements

- .1 Submit submittals as requested by the *Contract Documents*, as specified herein, and in accordance with the submittals schedule prepared in accordance with Section 01 32 00.
- .2 In addition to submittals specifically requested by the *Contract Documents*, submit other submittals as may be reasonably requested by the *Consultant*, or as are required to coordinate the *Work* and to provide the *Owner* with choices available, within the scope of *Contract Documents*.
- .3 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.
- .4 Make submittals with reasonable promptness and in an orderly sequence so as to cause no delay in the *Work*. Be solely responsible for delays, make up time lost, and pay added costs incurred because of not making submittals in due time to permit proper review by *Consultant*.
- .5 Once submitted, a submittal shall not be re-submitted until original submission has been reviewed by *Consultant* and returned to *Contractor*.
- .6 Submittals that contain substitutions will be rejected. Substitutions are permitted only in accordance with Section 01 25 00.
- .7 Do not proceed with work affected by a submittal, including ordering of *Products*, until relevant submittal has been reviewed by *Consultant*.
- .8 Prepare submittals using SI (metric) units.
- .9 *Contractor's* responsibility for deviations in submittal from requirements of *Contract Documents* is not relieved by *Consultant's* review of submittal, unless *Consultant* gives written acceptance of specific deviations.
- .10 Keep copies of reviewed submittals at the *Place of the Work* in an organized condition. Only submittals that have been reviewed by the *Consultant* and are marked with *Consultant's* review stamp, as applicable, are permitted at the *Place of the Work*.

Submittal Procedures

- .11 The *Work* shall conform to reviewed submittals subject to the requirements of this section. Remove and replace materials or assemblies not matching reviewed submittals at no increase in the *Contract Time* and at no additional cost to the *Owner*.
- .12 *Contractor's* review of submittals:
 - .1 Review submittals for conformity to *Contract Documents* before submitting to *Consultant*. Submittals shall bear stamp of *Contractor* and signature of a responsible official in *Contractor's* organization indicating in writing that such submittals have been checked and coordinated by *Contractor*. Review shall be performed by qualified personnel who have detailed understanding of those elements being reviewed and of the conditions at the *Place of the Work* proposed for installation.
 - .2 Check and sign each submittal and make notations considered necessary before submitting to *Consultant* for review. Where submittal is substantially and obviously in conflict with requirements of *Contract Documents*, reject submittal without submitting to *Consultant* and request resubmission. Note limited number of reviews of each submittal covered under *Consultant's* services as specified below.
 - .3 Assume sole responsibility for any conflicts occurring in the *Work* that result from lack of comparison and coordination of submittals required for the *Work*.
 - .4 Assume sole responsibility for dimensions to be confirmed and correlated at the *Place of the Work* for information that pertains to fabrication processes or to techniques of construction and installation, and for coordination of the *Work*.
 - .5 Submittals that have not been reviewed, checked, and coordinated by *Contractor* prior to submission to *Consultant*, or that do not bear the stamp and signature of *Contractor* as described above, will be stamped "REVISE AND RESUBMIT" and returned.
 - .6 Notify *Consultant* in writing of changes made on submittals from *Contract Documents*. *Consultant's* review of submittals shall not relieve *Contractor* of responsibility for changes made from *Contract Documents* not covered by written notification to *Consultant*.
- .13 *Consultant's* review of submittals:
 - .1 Review of submittals by *Consultant* is for the sole purpose of ascertaining conformance with the general design concepts and the general intent of the *Contract Documents*. This review shall not mean that *Consultant* approves the detail design inherent in the submittals, responsibility for which shall remain with the *Contractor*. Such review shall not relieve the *Contractor* of responsibility for errors or omissions in the submittals, nor of responsibility for meeting requirements of *Contract Documents*.

Submittal Procedures

- .2 As part of their scope of work, *Consultant* shall review *Shop Drawings* no more than twice. Should three or more reviews be required due to reasons of *Contractor* omissions causing resubmission requests, then *Contractor* shall reimburse the *Consultant* for time expended in these extra reviews. Time shall be invoiced to the *Owner* (to be deducted from monies due to the *Contractor* and paid to *Consultant* by *Owner*) at rates recommended by *Consultant's* professional association and disbursements shall be invoiced at *Consultant's* cost. The *Contractor* shall cover directly costs and administration associated with courier services and the like for these extra *Shop Drawings* reviews.
 - .3 *Consultant's* review and markings on submittals do not authorize changes in the *Work* nor in the *Contract Time*, and shall be accommodated at no additional cost to the *Owner*. If, in the opinion of the *Contractor*, the *Consultant's* markings on submittals constitute a change in the *Work* or will effect a change in the *Contract Time*, then the *Contractor* shall so notify the *Consultant* in writing and request an interpretation following the procedures for requests for interpretation in accordance with Section 01 31 00. If the *Consultant* finds that the *Consultant's* markings on submittals do constitute a change in the *Work* or will effect a change in the *Contract Time*, then a *Change Order* will be prepared therefore. The time taken to process such a request for interpretation shall not, in and of itself, constitute a change in the *Work* nor an increase the *Contract Time*.
 - .4 Submittals that are not required by the *Contract Documents* or not requested by the *Consultant* will not be reviewed by the *Consultant* and will be marked 'NOT REVIEWED' by the *Consultant* and returned to the *Contractor*.
- .14 Engineered submittals:
- .1 Submittals for items required to be sealed by professional engineer (engineered) shall be duly prepared, sealed, and signed under the direct control and supervision of a qualified professional engineer licensed in the jurisdiction in which the *Place of the Work* is located, having in force professional liability insurance with minimum coverage limit of \$2,000,000 per claim and annual aggregate.
 - .2 Include with engineered submittal, proof of insurance identifying insurer, policy number, policy term, and limit of liability, on duly signed letterhead and / or certificates of insurance.
 - .3 Design shall to be based on Post-Disaster Importance Category for Buildings in accordance with the building code.
 - .4 Design includes life safety, sizing of supports, anchors, framing, connections, spans, and as additionally required to meet or exceed requirements of applicable codes, standards, regulations, authorities having jurisdiction, and design requirements of the *Contract Documents*.
 - .5 Engineered submittals shall include design calculations, complete with references to codes and standards used in such calculations, supporting the proposed design represented by the submittal.

Submittal Procedures

- .6 Professional engineer responsible for the preparation of engineered submittals shall undertake periodic field review, including review of associated mock-ups where applicable, at locations wherever the work as described by the engineered submittal is in progress, during fabrication and installation of such work, and shall submit a field review report after each visit. Field review reports shall be submitted to the *Consultant*, to authorities having jurisdiction as required, and in accordance with the building code.
- .7 Field reviews shall be at intervals as necessary and appropriate to the progress of the work described by the submittal to allow the engineer to be familiar with the progress and quality of such work and to determine if the work is proceeding in general conformity with the *Contract Documents*, including reviewed shop drawings and design calculations.
- .8 Upon completion of the parts of the *Work* covered by the engineered submittal, the professional engineer responsible for the preparation of the engineered submittal and for undertaking the periodic field reviews described above, shall prepare and submit to the *Consultant* and authorities having jurisdiction, as required, a letter of general conformity for those parts of the *Work*, certifying that they have been provided in accordance with the requirements both of the *Contract Documents* and of the authorities having jurisdiction over the *Place of the Work*.
- .9 Costs for such field reviews and field review reports and letters of general conformity are included in the *Contract Price*.

1.3 Submission Procedures

- .1 Coordinate each submittal with requirements of the *Work* and *Contract Documents*. Individual submittals shall include related information.
- .2 Distribute copies of submittals to parties whose work is affected by submittals except *Consultant* and *Owner* before final submission for review by *Consultant*.
- .3 Accompany submittals with transmittal letter containing:
 - .1 Date.
 - .2 *Project* title and number.
 - .3 *Contractor's* name and address.
 - .4 *Contractor's* review stamp.
 - .5 Identification and quantity of each submittal.
 - .6 Other pertinent data.
- .4 Each submittal shall be identified numerically by relevant *Specifications* section number with a numeric indicator for multiple submittals by that section followed by revisions number, for example 04 05 19-01-R0.
- .5 Submit original PDF documents only: scanned documents shall not be accepted.
- .6 Make any changes in submittal that *Consultant* may require, consistent with *Contract Documents*, and resubmit as directed by *Consultant*.

Submittal Procedures

- .7 Notify *Consultant*, in writing, when resubmitting, of any revisions other than those requested by *Consultant*.
- .8 After *Consultant's* review, distribute copies to affected parties.

1.4 Certificates and Certification Submittals

- .1 Certificates and certifications submittals: Provide a statement that includes signature of entity responsible for preparing certification.

1.5 Product Data Sheets

- .1 Submit *Product* data sheets as follows:
 - .1 1 copy digitally in pdf format to *Consultant* using the *Consultant's* document management system.
- .2 Submit *Product* data sheets as called-for by the *Contract Documents* or as the *Consultant* may reasonably request where shop drawings will not be prepared due to a standardized manufacture of a *Product*. Manufacturers' catalogue cuts will be acceptable in such cases, providing that they are 213 mm x 275 mm (8-1/2" x 11") originals, and that they indicate choices including sizes, colours, model numbers, options and other pertinent data, including installation instructions. Submissions showing only general information are not acceptable.
- .3 Where requirements of *Contract Documents* are more stringent than design proposed on *Product* data sheets, the requirements of the *Contract Documents* take priority.
- .4 Upon completion of review by *Consultant*, 1 marked set of *Product* data sheets will be returned to *Contractor* in digital format for reproduction and distribution.
- .5 Retain 1 complete set of reviewed *Product* data sheets for issuance as part of closeout submittals in accordance with Section 01 78 00.

1.6 Shop Drawings

- .1 Submit *Shop Drawings* as follows:
 - .1 1 copy digitally in pdf format to *Consultant* using the *Consultant's* document management system.
- .2 Lettering on *Shop Drawings* shall be not less than 3 mm (1/8") high.
- .3 Reproduction of construction *Drawings* to serve as background for *Shop Drawings* is not permitted.
- .4 Where requirements of *Contract Documents* are more stringent than design proposed on *Shop Drawings*, the requirements of the *Contract Documents* take priority.
- .5 *Consultant* markings and resulting action required:
 - .1 *Shop Drawings* requiring no changes will be marked 'REVIEWED', and shall be submitted for as-built drawings purposes.
 - .2 *Shop Drawings* requiring several changes will be marked 'REVIEWED as NOTED' and shall be revised and submitted for as-built drawings purposes.

Submittal Procedures

- .3 *Shop Drawings* requiring substantial changes will be marked 'REVISE AND RE-SUBMIT' and shall be revised and resubmitted until *Consultant* stamps *Drawings* with 'REVIEWED' or 'REVIEWED as NOTED'.
- .6 *Shop Drawings* size shall be multiple of 213 mm and 275 mm (8-1/2" and 11") excluding 38 mm (1-1/2") binding margin and not larger than 838 mm x 1117 mm (33" x 44"). Leave minimum 150 mm x 100 mm (6" x 4") clear space for *Consultant's* comments.
- .7 Upon completion of review by *Consultant*, 1 marked set of *Shop Drawings* will be returned to *Contractor* in digital format for reproduction and distribution.
- .8 Retain 1 complete set of reviewed *Shop Drawings* for issuance as part of closeout submittals in accordance with Section 01 78 00.
- .9 Submit copies of reviewed *Shop Drawings* to authorities having jurisdiction as required.
- .10 *Shop Drawings* shall include:
 - .1 Fabrication and erection dimensions.
 - .2 Plans, sections, elevations, arrangements and sufficient full size details which indicate complete construction, components, methods of assembly as well as interconnections with other parts of the *Work*.
 - .3 Design calculations for items that require design calculations.
 - .4 Clear definition of the division of responsibility for the work described thereon. No *Products*, items or equipment, or description of work, shall be indicated to be supplied, or work to be done, "By Others" or "By Purchaser". *Shop Drawings* marked with either of these phrases shall be rejected without having been reviewed by the *Consultant*.
 - .5 Location and type of exposed anchors, attachments and locations and types of fasteners, including concealed reinforcements to accept mounted fasteners.
 - .6 Adhesives, joinery methods and bonding agents.
 - .7 Kinds and grades of materials, their characteristics relative to their purpose, detailed description of finishes and other fabrication information.
 - .8 Configurations, types and sizes required; identify each unit type on drawing and on *Product*.
 - .9 Descriptive names of equipment and mechanical and electrical characteristics when applicable.
 - .10 Data verifying that superimposed loads will not affect function, appearance and safety or work shown on shop drawings, as well as other interconnected work.
 - .11 Assumed design loadings, dimensions of elements and material *Specifications* for load-bearing members.
 - .12 Proposed chases, sleeves, cuts and holes in structural members.
 - .13 Wall thicknesses of metals.
 - .14 Location and types of welds. For structural welds use AWS symbols and clearly show net weld lengths and sizes.

Submittal Procedures

- .15 Materials, gauges, and sizes being supplied including connections, attachments, reinforcement, anchorage and locations of exposed fastenings.
- .16 Installation instructions and details for *Products* to be installed by separate *Subcontractors*, including function of each part.
- .17 A list of *Products* covered by, or included on, the shop drawing. List of *Products* shall be complete and show manufacturer's name, *Product* name, generic description, standard certification where specified, manufacturer's complete installation data and precautions against wrong installation, operation and maintenance.
- .18 Refer to individual sections of the *Specifications* for more particular requirements for *Shop Drawings*.
- .19 Compatibility statement: Include with each *Shop Drawings* a statement that each *Product* and material indicated on the *Shop Drawings* is compatible with each *Product* and material with which it comes into contact.

1.7 Engineered Judgements

- .1 When an engineered judgement is required by authorities having jurisdiction, such engineered judgement shall be prepared as an engineered submittal in accordance with Section 01 33 00.

1.8 Project Firestopping Manual and Coordination

- .1 The *Contractor* shall assign a firestopping and smoke seal firestopping coordinator to coordinate the firestopping details and systems required in the *Work*. Applicator shall designate a single individual as *Project* foreperson who shall be present at the *Place of the Work* throughout the *Work*.
- .2 Firestopping manual:
 - .1 *Contractor* and firestopping and smoke seal coordinator shall prepare a preliminary fire stopping manual, inclusive of all firestopping systems in the *Work*, to be submitted to the *Consultant* prior to the installation of any firestopping and smoke seal work.
 - .2 Manual shall include:
 - .1 Project key plans of each level, with enlarged key plans at areas where required, which identify and tag each anticipated penetration and fire stopping location and type (i.e. multiple metallic pipes through gypsum board wall assembly; single metallic pipe through concrete floor assembly, and the like).
 - .2 *Product* data sheets: data and installation instructions for *Products* providing descriptions sufficient for identification at the *Place of the Work*.
 - .1 Materials list of *Products* proposed for use in the *Work*; complying with listed systems designs.
 - .2 Listing agency's detailed drawing showing joint assemblies and firestopping materials, identified with listing agency's name and number or designation, fire rating achieved, and date of listing.

Submittal Procedures

- .3 Manufacturers' installation instructions and recommendations.
- .3 *Shop Drawings*:
 - .1 Submit drawings indicating fire resistance rated assembly number, required temperature, hose stream, and flame rating, material thicknesses, installation methods and materials of firestopping and smoke seals, primers, supports, damming materials as applicable, reinforcements, anchorages, fastenings and methods of installation for each condition to be encountered.
 - .2 Designate on *Shop Drawings* static through penetrations and dynamic joint systems, relative positions, expansion and control joints in rated slabs and walls, and firestopping details.
 - .3 Engineered *Shop Drawings*; for engineering judgements:
 - .1 Where *Project* conditions require modification to an accredited third party testing agency's listed system design to address a particular firestopping condition that is not covered by a listed system, submit engineered shop drawings detailing the modifications to the listed system design as an engineering judgment or equivalent fire-resistance-rated assembly, for each *Project* location and condition.
 - .2 Submit the manufacturer's engineering judgment identification number and *Shop Drawings* details prepared by a professional engineer. The engineering judgment submittal shall include both *Project* name, *Project* location, and *Subcontractor's* name who will install firestop system as described in engineering judgement *Shop Drawings*.
 - .3 Provide complete details of specific application of listed system and its modifications upon which the engineered judgement is based upon.
 - .4 For perimeter fire barrier systems:
 - .1 Submit engineered *Shop Drawings* for engineering judgements covering perimeter fire barrier systems. Identify each cladding assembly type in contact with each perimeter fire barrier system.
 - .4 Fire resistance rating test listings for firestopping and smoke seal systems.
 - .3 Firestopping manual shall be submitted within 4 weeks of *Contract* award.
 - .4 Prior to concealment of firestopping conditions above a ceiling or by another assembly or finish, the *Contractor* shall submit an updated firestopping manual including as-built drawings that identify firestopping conditions and penetrations.
- .3 Closeout submittals:
 - .1 Submit closeout submittals in accordance with Section 01 78 00.
 - .2 Submit the following certification documents with closeout submittals:
 - .1 Manufacturer's certification: Submit manufacturer's certification that installed firestopping and smoke seal *Products* are suitable for the use indicated and comply with specified requirements.

Submittal Procedures

- .2 Installation certification: Installer shall submit certification that all joint firestopping system installations are completed and that installations comply with listed systems designs.
- .3 As-built copy of the firestopping manual.

1.9 Samples

- .1 Submit a minimum of 3 samples unless a greater amount is specified.
- .2 Deliver samples to the following location with expenses, including carrying costs, prepaid, unless otherwise instructed:
 - .1 *Consultant's* home office.
- .3 Identify samples or assemblies by *Project* number and name, name of *Consultant*, *Contractor* and *Subcontractor*, and date of submission. Identify location, specified material reference and any other pertinent information. Show construction by layered method if necessary, clearly displaying textures and patterns.
- .4 Where a required colour, pattern or texture has not been specified, submit full range of available *Products* meeting other specified requirements.
- .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*.
- .6 Resubmit samples until written acceptance is obtained from *Consultant*.
- .7 Reviewed and accepted samples will establish the standard against which installed *Work* will be reviewed.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Healthcare Facility Procedures

PART 1 - GENERAL

1.1 General Procedures

- .1 For the purposes of this section:
 - .1 The words “worker” or “workers” shall mean the *Contractor*, *Contractor's* staff or employees, *Subcontractors*, *Subcontractor's* staff or employees, *Suppliers*, *Supplier's* staff or employees, or anyone engaged for the *Work*, directly or indirectly, by the *Contractor*, unless specifically noted otherwise.
 - .2 The words “make good” or “making good” shall mean that, when a finish or material has been altered, the material or finish shall be repaired or replaced, and refinished to match existing quality and appearance to acceptance of *Consultant*, and that repaired or replaced and refinished *Work* shall not be discernible from existing materials or finishes when judged by the *Consultant* from a viewing distance of 1830 mm (6'), and that such work is included in the *Contract Price*.
 - .3 The working day of the healthcare facility is as noted below:
 - .1 Regular business hours: 5:30 a.m. to 9:00 p.m. every day of the week.
 - .2 Emergency department: 24 hours a day, every day of the week, all work must be coordinated with Owner.
- .2 Conform to the *Owner's* guidelines and policies. In case of conflict between the *Owner's* guidelines and policies and the remainder of the *Contract Documents*, the *Owner's* guidelines and policies shall govern.
- .3 Operational limitations:
 - .1 The existing building will remain in full use and occupancy throughout the *Work*, except for such parts of the building that have been vacated for the *Work*.
 - .2 *Contractor's* use of the *Place of the Work* is limited to permit regular use of *Owner's* facilities to continue with the least amount of interference possible.
 - .3 In consultation with, and to acceptance of, the *Consultant* in the presence of the *Owner*, designate an entrance and a circulation route that workers shall use and that shall not be used by *Owner's* staff, building occupants, or the public.
- .4 Dust tight enclosure and partition doors or flaps and entrance doors to the *Place of the Work* shall remain closed.
- .5 Areas of the existing building adjacent to the *Place of the Work* or areas affected by the *Work*, including circulation and access routes, shall be maintained in a clean state equivalent to the level of cleanliness maintained in the existing building, and as follows:
 - .1 Clean and vacuum the *Place of the Work* and areas surrounding the *Place of the Work* daily or more frequently as required.
 - .2 Provide tack mats at access doors to the *Place of the Work* so that workers can remove dust and debris from their footwear when exiting the *Place of the Work*. Replace or clean daily, or more frequently as required.
 - .3 Wet mop floor areas in vicinity of access doors to the *Place of the Work* daily, or more frequently as required.

Healthcare Facility Procedures

- .4 Vacuum carpeted areas daily or more frequently as required.
- .5 Wet clean carpets in accordance with manufacturer's recommendations once work in such areas is complete.
- .6 Final cleaning shall be in accordance with Section 01 77 00.
- .6 Waste protection and removal:
 - .1 Waste management and disposal shall be in accordance with Section 01 50 00 and as supplemented herein.
 - .2 Transport waste in containers with tightly fitting lids or cover waste with a wet sheet.
 - .3 Remove waste as it is created. Debris shall be contained and covered if it can not be removed immediately.
 - .4 Remove waste at the end of each *Working Day* through construction access routes or as approved by *Owner*.
- .7 Document condition of the existing building in areas immediately adjacent to the *Place of the Work* by means of construction photographs in accordance with Section 01 32 33.
- .8 Workers shall remove dust from body and clothing by vacuum cleaning prior to traversing patient care areas.
- .9 In areas designated by the *Owner*, workers shall be required to wear protective clothing as directed by the *Owner*. Protective clothing shall be removed upon exiting designated areas.
- .10 Walkie-talkies shall not be used in the existing building without the express, written approval of the *Owner*.
- .11 Safety clearances are required before any cutting, welding, core drilling, or open flame work is done. A request in writing to the *Owner* must be made and approved a minimum of 1 *Working Day* prior to commencing such work.

1.2 Temporary Ventilation

- .1 *Provide* temporary ventilation in accordance with Section 01 50 00 supplemented as follows:
 - .1 *Provide* negative pressure air ventilation as described below.
 - .2 Ensure quality of intake air to existing building through existing intake louvres is not compromised by dust or noxious or odorous fumes.

1.3 Security

- .1 The *Contractor* shall be solely responsible for securing the *Place of the Work* and the *Work*, and for securing areas used for the storage of *Products* or construction machinery and equipment. The *Owner* shall have no responsibility in this regard.
 - .1 *Provide* and maintain security lighting.
 - .2 *Provide* and maintain temporary locks. Premises to be locked after working hours.

Healthcare Facility Procedures

- .2 Provide security for the *Place of the Work* by methods compatible with the security system for the existing building.
 - .1 *Contractor* shall coordinate the *Work* with the *Consultant* in the presence of the *Owner* in order to ensure no disruption to the existing building's security system.
 - .2 Where existing building's security system is breached due to *Contractor's* negligence, be responsible for any damage or theft of property, regardless if area where damage or theft occurred is under *Contractor's* control or not.

1.4 Use of Existing Facilities

- .1 Restrict access, parking, material deliveries, execution of work, operations and procedures to designated locations and times and do not deviate from designated procedures without prior acceptance by the *Consultant* in the presence of the *Owner*.
- .2 Periodically review proposed construction operations with the *Consultant* in the presence of the *Owner* and cooperate as required to ensure that *Owner's* interests and requirements are not unduly compromised with regard to the normal operation and function of occupied areas on the existing building.
- .3 Workers shall not be permitted to use the hospital cafeteria.
- .4 While working in the existing hospital, workers shall not remain in areas in which they are working for meals and breaks. Workers shall not be permitted to have meals or take breaks in the existing hospital. Meals shall and breaks shall be taken in the site office, or away from the *Place of the Work*.
- .5 Traffic through existing occupied areas of the hospital shall be kept to a minimum. Travel within existing occupied areas of the hospital shall be via the most direct route that does not pass through patient wards or sensitive areas.
- .6 Noise, dust and debris, and odours shall be minimized to ensure hospital staff and patients in adjacent areas are disturbed as little as possible. Corrective action to cease or limit disagreeable annoyances to hospital staff and patients shall be implemented immediately upon notification by the *Consultant* or the *Owner*.
- .7 Use of new or existing laundry and garbage chutes shall not be permitted.
- .8 Use of existing containers and garbage bins shall not be permitted.
- .9 Use of existing elevators shall not be permitted.
- .10 Existing fire protection equipment:
 - .1 Existing fire protection equipment, such as fire extinguishers and hoses, shall only be used in an emergency situation.
 - .2 Do not remove existing fire protection equipment.
 - .3 If any existing fire protection equipment is used or interfered with in any way, the *Owner's* fire equipment inspector shall be retained to inspect, test, recharge, and otherwise repair such equipment at no additional cost to the *Owner*.
- .11 Temporary sanitary facilities:
 - .1 Provide and maintain temporary sanitary facilities for use by workers, including separate, stand-alone, dedicated washrooms for women only. The use of existing building's sanitary facilities by workers shall be prohibited.

Healthcare Facility Procedures

.12 Temporary site office:

- .1 Provide heated, lighted, air conditioned and ventilated site office, of sufficient size to accommodate site meetings for 12 people, and furnished with drawing layout table, filing cabinets, telephone, and Wi-Fi as described in Section 01 50 00.
- .2 Provide an office for Owner's staff in or besides the trailer, sized minimum 9'x9' and large enough for a single workstation with power and data.

1.5 Parking

- .1 Parking for workers shall not be made available by the *Owner*.
- .2 Throughout the *Work*, ensure that there is no interference with the operation of the existing premises, and that the existing parking areas and road system remain free and clear of obstructions.
- .3 Illegally parked vehicles will be ticketed and/or towed at vehicle owner's expense, and at no additional cost to the *Owner*.

1.6 Dust Tight Partitions and Enclosures

- .1 Dust tight partitions and enclosures shall be in accordance with Section 01 50 00, as supplemented herein.
- .2 Dust tight partitions:
 - .1 *Provide* dust tight partitions to localize dust generating activities, and for the protection of workers, hospital staff, patients, the public, and finished areas of the *Work*.
 - .2 Dust tight partitions are temporary, weather tight, dust, tight, and lockable partitions between occupied areas of the existing hospital and areas where the *Work* is being performed, and include treatment of joints, cracks, and openings in partitions to prevent dust from entering occupied areas of the hospital.
 - .3 Dust tight partitions shall be assemblies with 1 hour fire resistance rating complete with doors and frames having 3/4 hour fire resistance ratings.
 - .4 Construct dust tight partitions as follows:
 - .1 *Provide* 92 mm (3-5/8") steel studs at 400 mm (16") on centre, with 2 rows of bracing between studs and additional bracing for gypsum board finish. Steel studs shall be in accordance with Section 09 22 00.
 - .2 *Provide* fire resistance rated tarpaulins fastened to studs on the side of the partition opposite to the occupied areas of the hospital. Lap joints 100 mm (4") minimum, and seal laps and perforations dust tight with 75 mm (3") wide plastic film tape.
 - .3 *Provide* 1 layer of 12.7 mm (1/2") thick square edge fire resistant gypsum board over both side of partition. Seal joints with 75 mm (3") wide plastic film tape. Gypsum board and installation shall be in accordance with Section 09 29 00.
 - .4 *Provide* felt gaskets around perimeter of partitions.

Healthcare Facility Procedures

- .5 Paint sides of partitions exposed to occupied areas of the existing building in accordance with Section 09 91 00, colour as to later selection by the *Consultant*.
- .3 Dust tight enclosures:
 - .1 Where minor isolated alteration work occurs in the existing building and a dust tight partition is not feasible, *Provide* a mobile containment system, extending floor to ceiling.
 - .2 Mobile containment system shall be fabricated of an adjustable aluminum frame, vinyl enclosure with pressure porthole, wheel base platform, and disposable plastic liner, and sized as required.
 - .3 *Provide* HEPA filter vacuum device and manometer and connect to pressure porthole.
 - .4 Acceptable *Product*: Kontrol Kube Topsider or Kontrol Kube Topsider Jr., as manufactured by Fiberlock Technologies Inc., or approved alternate.
- .4 Maintain and relocate dust tight partitions and enclosures until dust generating work is complete, or until directed otherwise in writing by the *Consultant* in consultation with the *Owner*.
- .5 *Provide* "Construction Zone" signage outside dust tight partitions and enclosures, manufactured by signage company, with minimum 75 mm (3") letters.

1.7 Infection Prevention and Control Procedures

- .1 Infection control procedures shall be in accordance with the document "Infection Control During Construction, Renovation and Maintenance of Health Care Facilities" and CAN/CSA Z317.13-22.
- .2 Training:
 - .1 Provide workers with training in infection prevention and control procedures.
 - .2 Training shall be provided a specialized infection prevention and control consultant approved by the *Owner*.
 - .3 The *Contract Price* includes the cost for the required number of training sessions to adequately cover the duration of the *Project*.
 - .4 Proof of successful completion of such training shall be submitted to the *Owner* in the form of a certificate issued by the infection prevention and control consultant providing the training. Training certificate shall be submitted before a worker undertakes any work at the *Place of the Work*.
- .3 The *Owner* specialized infection control consultant shall assess the risks related to the project utilizing the document "Infection Control During Construction, Renovation and Maintenance of Health Care Facilities" and CAN/CSA Z317.13-22.
- .4 Field review of the *Work* and on-going infection prevention and control procedures shall be undertaken on a regular basis by the specialized infection prevention and control consultant in the presence of the *Contractor*. Procedures for such field reviews shall be the same as those for inspection and testing in accordance with Section 01 45 00.

Healthcare Facility Procedures

- .5 At *Contract* start-up meeting, convened in accordance with Section 01 31 19, review infection prevention and control procedures. The specialized infection prevention and control consultant shall attend the *Contract* start-up meeting. Subjects to be reviewed include, but are not limited to, the following:
 - .1 General information on infection prevention and control procedures.
 - .2 Identification of patient populations that may be at risk.
 - .3 Prevention measures for essential services that may be disrupted.
 - .4 The integrity of the facility's exterior structure, spatial separations, ventilation and water supplies for any infection control problems.
 - .5 Methods for dust containment and removal of construction debris.
 - .6 Traffic patterns for construction workers and supply delivery routes to minimize risks to patients, staff and visitors.
 - .7 The need for increased filter changes during the *Work*.
 - .8 The need to close down dampers temporarily to reduce circulation of contaminated air or fumes.
 - .9 Systems that can provide the required air exchange rates and pressure relationships in critical areas near construction activity.
 - .10 Schedule of field reviews by the specialized infection prevention and control consultant.
- .6 Vacuum cleaners:
 - .1 Vacuums shall be commercial grade complete with HEPA filters.
 - .2 HEPA filter shall be changed as recommended by the manufacturer or required by use. Maintain a filter change log at the *Place of the Work*, available for review by the *Owner*.
- .7 The following precautions, as a minimum, shall be taken when working on existing walls, ceilings, floor spaces, ducts and piping systems as the dust and dirt collected in these areas may contain disease causing germs:
 - .1 Prior to work being done or the removal of ceiling tiles, or opening of ceiling access hatches, erect floor to ceiling dust tight partitions and enclosures as described above to completely enclose the area where such work is being performed.
 - .2 Remove acoustical ceiling panels keeping horizontal, and vacuum clean the panels immediately prior to removal.
 - .3 Existing air ducts, conduits, and spaces above the ceiling shall be vacuum cleaned prior to the start of work in such areas.
 - .4 Remove dust tight partitions and enclosures when work is finished or prior to the start of hospital working day, and remove marks left by tape or studs, and enclose ceiling areas with no obstructions to mechanical and electrical devices in the ceiling space.
 - .5 Vacuum clean interior of dust tight partitions and enclosures prior to their removal.
 - .6 Vacuum clean area enclosed by dust tight partitions and enclosures after removal of the dust tight partitions and enclosures.

Healthcare Facility Procedures

.8 Negative pressurization

- .1 Areas where work is being undertaken shall be isolated from occupied areas of the hospital using dust tight partitions and enclosures as described above.
- .2 The *Place of the Work* will be maintained under negative pressure at all times in relation to the occupied areas of the existing building to prevent dust and airborne pathogens from entering the occupied areas of the existing building.
- .3 Negative pressure shall be achieved through the use of dedicated (window or otherwise) exhaust units or, if direct access cannot be achieved, by HEPA filtered recirculation units that transfer filtered air from the *Place of the Work* into the occupied areas. Exhaust points will be reviewed with the *Owner* to ensure that the exhaust air from the *Place of the Work* is not affecting pedestrian routes and is not re-entrained back into the existing building through fresh air intakes.
- .4 *Provide* construction exhaust/HEPA units and remove at the completion of the *Work*.
- .5 Air systems serving only the *Place of the Work* will be shut down and all supply, return and exhaust openings shall be sealed to prevent dust and construction debris from entering the air system. As a further precaution, the air system will be reviewed at the end of the *Work* to determine if cleaning is required.
- .6 Supply and return air ducts entering the *Place of the Work* are to be fitted with a pre-filter unit and sealed within the *Place of the Work* near point of entry or exit prior to the start of disruptive activity to prevent dust and construction debris from entering the air system. As a further precaution, the air system will be reviewed at the end of the *Work* to determine if cleaning is required.
- .7 During construction, the seal only on the supply air duct may be removed after demolition and clean-up to permit ventilation within the construction area provided no other means is available.

1.8 Existing Services

.1 Service interruptions:

- .1 Connection or disconnection of services that will interfere with the operation of the *Owner's* facilities shall not be done without the prior written acceptance of the *Consultant* in the presence of the *Owner* and during the times designated by the *Owner*. Premium charges associated with such work shall be included in the Contract Price.
- .2 Provide at least 10 *Working Days* prior written notice to the *Consultant* and the *Owner* of requirement or intention to interrupt services, and obtain written permission of the *Consultant* in the presence of the *Owner* prior to commencing such interruption.
- .3 In no instance shall interruptions affect the entire existing building.
- .4 As far as possible, coordinate interruptions with the *Owner's* regular maintenance of building services and systems.

Healthcare Facility Procedures

- .5 Areas adversely affected by changes in air flows outside the construction areas as a result of a required shut-down of portions of the existing HVAC system within the construction areas are to be re-balanced to comfortable levels as advised by the *Consultant*.
- .2 Should existing services be interrupted in breach of the above, make good immediately and provide protection against further such disruptions. Costs resulting from such interruptions and for making good shall be the responsibility of the *Contractor* at no additional cost to the *Owner*.

1.9 Protection of the Existing Building

- .1 Protection requirements shall be in accordance with Section 01 50 00, as supplemented herein.
- .2 Keep *Place of the Work* safe and secure, denying access to unauthorized personnel.
- .3 Protect existing work from damage. Make good any damage caused. The onus is on the *Contractor* to substantiate that damage existed prior to commencement of the *Work*.
- .4 Do not overload the existing structure due to the *Work*.
- .5 Take special measures to protect existing work from damage when moving heavy loads or equipment. Protect areas used as passageways or through which materials are moved. Use resilient tired conveyances only when moving materials and equipment inside building. *Provide* coverings as required to protect existing work from damage.
- .6 Separate exterior access, work and storage areas from *Owner* occupied existing areas, with fencing and hoarding as specified in Section 01 56 23. Rearrange fencing/hoarding as *Work* progresses to suit extent and configuration of the *Work*.
- .7 *Provide* guards, barricades and other temporary protection to prevent injury to persons.
- .8 Protect existing building components and contents from damage by weather, when executing *Work* affecting integrity of the building envelope. *Provide* temporary insulated and air tight weatherproof closures to protect openings made in existing building envelope. Make good existing building components and contents damaged by weather resulting from inadequate temporary protection measures.
- .9 Protection of existing occupied areas:
 - .1 Existing exterior walls with windows of plain glazing, when exposed to the *Work*, shall be protected with 16 mm (5/8") gypsum board for interior surfaces and 9.5 mm (3/8") exterior grade plywood for exterior surfaces, mounted on suitable framing.
 - .1 Plywood: in accordance with Section 06 10 53.
 - .2 Metal framing: in accordance with Section 09 22 00.
 - .3 Gypsum board: in accordance with Section 09 29 00.
 - .2 Maintain such protection throughout the *Work*.
 - .3 Other openings in the existing exterior walls, such as doors and louvers, shall be similarly protected or replaced with doors of solid core wood or hollow steel construction.

Healthcare Facility Procedures

1.10 Emergency and Fire Protection

- .1 *Provide* and maintain ready access to fire protection equipment, in accordance with Section 01 50 00 and 01 51 16.
- .2 Immediately implement any request or instruction made by the hospital's fire marshal.
- .3 *Provide* temporary fire resistant closures at existing areas openings exposed to construction areas for the *Work* to maintain fire and life safety of existing building.
- .4 *Contractor* shall coordinate the work with the *Owner* in order to ensure no disruption to the existing fire detection and annunciation systems. Failure to provide such coordination shall result in the *Contractor* incurring the responsibilities and expenses associated with disruption to the existing fire detection and annunciation systems at no additional cost to the *Owner*.
 - .1 Provide fire watch when existing fire detection and annunciation systems are not operational or on bypass.
 - .2 Whenever a changeover time occurs, which is an outage time of at least a portion of the fire alarm system, the municipal fire department shall be notified of the temporary shutdown and alternative measures shall be devised.
- .5 *Contractor* shall coordinate the work with the *Consultant* in the presence of the *Owner* in order to prevent unapproved disruptions to the existing sprinkler system, standpipe system, or other fire protection systems.
 - .1 Where temporary shut-down is necessitated, such shut down shall be in accordance with the requirements of authorities having jurisdiction and the Ontario Fire Code.
- .6 Obtain 'Hot Work Permit' from *Owner's* Facilities team prior to hot work operation, which may cause the building's fire alarm system to be activated or create an unwarranted fire risk condition. The prevention of fires and false fire alarms caused by hot work operations is the primary goal of this procedure. Gas hoses, backflow preventers, fire resistive tarpaulins, curtains and other cutting and welding equipment must be in good repair before the permit is issued.
 - .1 'Hot Work' is defined as work using open flames or sources of heat that could ignite materials in the work area.
- .7 Fire separations:
 - .1 Maintain the integrity of fire separations, fire protection systems, and fire rated assemblies.
 - .2 Make good fire separations, fire protection, and fire rated assemblies compromised as a result of the *Work*.
- .8 Maintaining existing building exit facilities:
 - .1 Maintain exit facilities serving the existing building.
 - .2 Where an exit is blocked-off or deleted as a result of the *Work*, an alternative exit shall be *Provided* that is acceptable to the *Consultant*, the *Owner*, and authorities having jurisdiction.

Healthcare Facility Procedures

- .3 Where it is necessary for access to be gained to an exit through the *Place of the Work*, the access shall be clearly defined and protected so that it is separated from construction areas by a smoke tight fire separation equivalent to a minimum of 1 hour fire resistance rating, unless otherwise indicated.
- .9 Intersecting corridors:
 - .1 *Provide* temporary fire separations between existing corridors on occupied floor areas and new corridors under construction.
 - .2 Construct temporary fire separations out of steel studs and gypsum board to provide a construction equivalent to a minimum of 1 hour fire resistance rating, unless otherwise indicated.
 - .1 Firestopping and smoke sealant: in accordance with Section 07 84 00.
 - .2 Steel studs: in accordance with Section 09 22 00.
 - .3 Gypsum board: in accordance with Section 09 29 00.
 - .3 Where access is required, the doorway shall be protected by a door of solid core wood or hollow steel construction.
 - .4 Finish hardware equivalent to a minimum of 1 hour fire resistance rating, unless otherwise indicated.
- .10 Fire department access:
 - .1 Do not obstruct access route designated for fire department equipment.
 - .2 If it is necessary that existing access routes be obstructed or deleted, alternative access routes acceptable to the fire department and in accordance with the requirements of the *Contract Documents* and authorities having jurisdiction shall be provided prior to commencement of work that will obstruct or delete existing access.
 - .1 Coordinate the relocation of the fire hydrant in front of the ambulance garage with the fire department.
- .11 Combustible materials:
 - .1 Stockpiling of combustible materials adjacent to or inside the existing building shall not be acceptable.
- .12 Temporary protection of openings in fire separations:
 - .1 Openings in existing floor assemblies and vertical fire rated assemblies required by the *Work*, shall be temporarily protected with materials as required to maintain continuity of the required fire resistance rating for existing fire rated assembly.

1.11 Missing Patient Search

- .1 In the event that the *Owner* is required to undertake a missing patient search, the *Contractor* shall undertake a detailed search of the *Place of the Work*, under the direction of the *Owner*.

Healthcare Facility Procedures

PART 2- PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Acronyms and Abbreviations

PART 1 - GENERAL

1.1 Abbreviations and Acronyms

- .1 Refer to the various parts of the *Contract Documents* for additional abbreviations and acronyms not listed above.
- .2 Abbreviations and acronyms that may be used in the *Contract Documents* include, but are not limited to, the following:
 - .1 AABC Associated Air Balance Council
 - .2 AAMA American Architectural Manufacturers Association
 - .3 AB Acoustic Baffle
 - .4 ABS Acrylonitrile Butadiene Styrene
 - .5 AC Alternating Current
 - .6 ACI American Concrete Institute
 - .7 AC/PNL Acrylic Panel
 - .8 ACR Air Conditioning and Refrigeration Field Services
 - .9 ACT Acoustic Ceiling Tile
 - .10 ACTR Activity Room
 - .11 AD Access door (hinged)
 - .12 ADD Addendum
 - .13 ADJ Adjustable
 - .14 ADL Aids Daily Living
 - .15 ADO/M Automatic Door Operator - Motion Detector Operation
 - .16 ADO/P Automatic Door Operator - Push Plate Operation
 - .17 ACS Adult Change Station
 - .18 AF Access Flooring
 - .19 AFBMA Anti-Friction Bearing Manufacturers Association
 - .20 AFF Above Finished Floor
 - .21 AGG Aggregate
 - .22 AHRI Air-Conditioning, Heating and Refrigeration Institute
 - .23 AISI American Iron and Steel Institute
 - .24 A/HK Apron Hook
 - .25 ALUM Aluminum
 - .26 ALC/D Alcohol Dispenser
 - .27 AMCA Air Movement and Control Association

Acronyms and Abbreviations

.28 AMP	Acoustic Metal Panel
.29 amp	Ampere
.30 AMHR	Anti-Microbial Hand Rinse
.31 ANN/PNL	Annunciator Panel
.32 ANOD	Anodized
.33 ANSI	American National Standards Institute
.34 AODA	Accessibility for Ontarians with Disabilities Act
.35 AP	Access Panel (non-hinged)
.36 APPROX	Approximate
.37 AR	Accent Rail
.38 ASB	Asbestos
.39 ASME	American Society of Mechanical Engineers
.40 ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.,
.41 ASTM	American Society for Testing and Materials
.42 AV	Audio Visual
.43 AWG	American Wire Gauge
.44 AWI	Architectural Woodwork Institute
.45 AWMAC	Architectural Woodwork Manufacturers Association of Canada
.46 AWP	Acoustic Wall Panel
.47 AWS	American Welding Society
.48 BACS	Building Automatic Control System
.49 B/BD	Backer Board
.50 BEDG	Bedroom General
.51 BEDS	Bedroom Special
.52 BICSI	Building Industry Consulting Service International
.53 BIL	Basic Impulse Level
.54 B/PL	Base Plate
.55 BH/CON	Bushhammered Concrete
.56 BHD	Bulkhead
.57 BK/BD	Black Board
.58 BL	Bed Locator
.59 BLDG	Building

Acronyms and Abbreviations

.60 BN	Bullnose
.61 BP/GL	Back-painted Glass
.62 BPR	Bed Pan Rack
.63 BR	Bedroom
.64 BRK	Brick
.65 BSMT	Basement
.66 CARP(CPT)	Carpet
.67 CB	Catch Basin
.68 CCMPA	Canadian Concrete Masonry Producers Association
.69 CCTV	Closed Circuit Television
.70 CK/BD	Chalkboard
.71 CE	European Conformity for European Economic Area
.72 CEM	Cement
.73 CEM/BD	Cementitious Board
.74 CEM/FIN	Cement Finish
.75 CEM/PLAS	Cement Plaster
.76 CEPA	Canadian Environmental Protection Act
.77 CER/T	Ceramic Tile
.78 CFC	chlorofluorocarbons
.79 CG	Corner Guard
.80 CGSB	Canadian General Standards Board
.81 CHR	Change Room
.82 CH/RL	Chair Rail
.83 CISC	Canadian Institute of Steel Construction
.84 CIR	Circulation
.85 CJ	Construction Joint
.86 CK/BD	Chalkboard
.87 CK/T	Cork Tile
.88 CL	Centre Line
.89 CLG	Ceiling
.90 CLG-WDLK	Wood-look Ceiling Planks
.91 CLR	Colour
.92 CLR/CON	Coloured Concrete

Acronyms and Abbreviations

.93 CLR/GL	Clear Glass
.94 CMR	Communications Multipurpose Cable, Riser-rated
.95 CMP	Communications Multipurpose Cable, Plenum-rated
.96 CMU	Concrete Masonry Unit
.97 COL	Column
.98 COMM	Communication
.99 COMP/T(COMPT)	Composite Tile
.100 CONC	Concrete
.101 CON/FL	Concrete Floor
.102 CONSTR	Construction
.103 CONT	Continuous
.104 CPU	Central processing unit
.105 CR	Crash Rail
.106 CRCA	Canadian Roofing Contractors Association
.107 CR/P	Chromium-rich oxide passivation
.108 CRCI	Contractor Removed, Contractor Installed
.109 CSCI	Contractor Supplied, Contractor Installed
.110 CSSBI	Canadian Sheet Steel Building Institute
.111 CR/HR	Crash Hand Rail
.112 CRK	Coat Rack
.113 CRMCA	Canadian Ready-Mix Concrete Association
.114 C/RK	Chart Rack
.115 C/ROD	Curtain Rod
.116 CSA	Canadian Standards Association
.117 CT	Curtain Track
.118 C/T	Clay Tile (block)
.119 CTJ	Control Joint
.120 C to C	Centre to Centre
.121 CUP	Cupboard
.122 CUP/D	Cup Dispenser
.123 CWB	Canadian Welding Bureau
.124 dBA	A weighted decibels
.125 DC	Direct Current

Acronyms and Abbreviations

.126	DCS	Diaper Change Station
.127	DDC	Direct Digital Control
.128	DEPT	Department
.129	DF	Decorative Finish
.130	D/F	Drinking Fountain
.131	DFP	Door Frame Protection
.132	DFP-F	Door Frame Protection Full Height
.133	DFP-H	Door Frame Protection Half Height
.134	DGP	Data Gathering Panel (access control)
.135	DFT	Dry Film Thickness
.136	DIA	Diameter
.137	DN	Down
.138	DP	Door Protection
.139	DP-F	Door Protection Full Height
.140	DP-H	Door Protection Half Height
.141	DP-K	Door Protection Kick Plate
.142	D/P	Diaper Pail
.143	DPDT	Double Pole Double Throw
.144	DPST	Double Pole Single Throw
.145	DVMS	Digital Video Management System
.146	DWG	Drawing
.147	EEMAC	Electrical Equipment Manufacturers Advisory Council
.148	EIA	Electronic Industries Alliance
.149	EL	Elevation (Above Datum)
.150	ELEC	Electrical
.151	ELV	Elevation (view)
.152	ELEV	Elevator
.153	EHO	Electric Hold Open
.154	EIFS	Exterior Insulated and Finish System
.155	EMT	Electric Metallic Tube
.156	ENT	Entrance
.157	EOL	End of Line
.158	EPD	Environmental Product Declaration

Acronyms and Abbreviations

.159	EPDM	Ethylene Propylene Diene Monomer
.160	EPNL	Electrical Panel
.161	E/PT, EPT	Epoxy Paint
.162	ES EN	European Standard
.163	ETL	Extract-Transform-Load
.164	EUP	Eastern Underpass Pavilion
.165	EQL	Equal
.166	E/TER (ETER)	Epoxy Terrazzo
.167	EVAC	Emergency Voice Alarm Communication
.168	EXAM	Examination
.169	EX or EXIST	Existing
.170	EXPJT	Expansion Joint
.171	EXP/P	Exposed Concrete Painted
.172	EXP/S	Exposed Concrete Sealed
.173	EX/ST (EXPSTR)	Exposed Structure
.174	FAF	Fluid Applied Flooring
.175	FCC	Federal Communications Commission
.176	FD	Floor Drain
.177	FHC	Fire Hose Cabinet
.178	FEC	Fire Extinguisher Cabinet
.179	FIN	Finish
.180	FFL	Finish Floor
.181	F/GL	Frosted Glass
.182	FL	Floor
.183	FM	Factory Mutual
.184	F/MIR	Framed Mirror
.185	FP	Frame Protection
.186	FP-F	Door Frame Protection Full Height
.187	FP-H	Door Frame Protection Half Height
.188	FR	Fire Retardant or Fire Rated
.189	FS	Fire Separation
.190	FSS	Folding Shower Seat
.191	F/SHLF	Folding Chart Shelf

Acronyms and Abbreviations

.192	F/T/GL	Frosted Tempered Glass
.193	F/WC	Fiberglass Wall Covering
.194	F/WGL	Frosted Wired Glass
.195	GA	Gauge
.196	GALV	Galvanized
.197	GANA	Glass Association of North America
.198	GB	Grab Bar
.199	GD	Glove Dispenser
.200	GEN	Generic Accessory
.201	GGH	Guelph General Hospital
.202	GLB	Glass Block
.203	GL	Glass
.204	GL/T	Glass Mosaic Tile
.205	GRAN	Granite
.206	GWB	Gypsum Board/ Gypsum Board Ceiling
.207	GWB/AR	Gypsum Board, Abuse Resistant
.208	GWP	Global Warming Potential
.209	HAMP	Hamper
.210	HB	Hose Bibb
.211	HC	Hollow Core Wood
.212	HCFC	Hydrochlorofluorocarbons
.213	HD	Hand Dryer
.214	HDN/CON	Hardened Concrete
.215	HM	Hollow Metal
.216	HN/D	Hairnet Dispenser
.217	H	Hand Rail
.218	HID	HID Global
.219	HOR	Horizontal
.220	hp or HP	Horsepower
.221	H-O-A	Hands-Off-Auto
.222	HPL	High Pressure Laminate
.223	HPC	High Performance Coating
.224	HR	Hour

Acronyms and Abbreviations

.225	HR/DR	Hair Dryer
.226	HS	Heath Strengthened
.227	HSKP (HKPG)	Housekeeping
.228	HT	Height
.229	HVAC	Heating, Ventilation, and Air Conditioning
.230	HWU	Head Wall Unit
.231	HYD	Hydrant
.232	ICAT	Information, Communication, and Automation Technology
.233	ICP	Infection Control Practitioner
.234	ICES	Interference-Causing Equipment Standard
.235	ID	Inside Diameter
.236	IEC	International Electrotechnical Commission
.237	IEEE	Institute of Electrical and Electronic Engineers
.238	IESNA	Illuminating Engineering Society of North America
.239	IGMA	Insulated Glass Manufacturers Association of Canada
.240	IMR	Imaging Room
.241	INS/GL	Insulated Glass
.242	ISO	International Organization for Standardization
.243	IPS	In Plane Switching
.244	IV/T	Intravenous Track
.245	JS	Janitor's Shelf
.246	JT	Joint
.247	kg	Kilogram
.248	kN	Kilonewton
.249	kPa	Kilopascals
.250	kVA	Kilovolt-amp
.251	L	Litre
.252	LAB	Laboratory
.253	LAM/GL	Laminated Glass
.254	LAN	Local Area Network
.255	LAV	Lavatory
.256	LCD	Liquid Crystal Display
.257	LD/GL	Leaded Glass

Acronyms and Abbreviations

.258	LED	Light Emitting Diode
.259	LEX/GL	Lexan Glazing
.260	LSGASM	Laminators Safety Glass Association Standards Manual
.261	LINO	Linoleum
.262	LKR	Locker
.263	LOG	Lounge
.264	LTSTD	Light Standard
.265	m	Metre
.266	MARB	Marble
.267	MATL	Material
.268	MATM	Materials Management
.269	MAX	Maximum
.270	MB	Marker Board
.271	M/BRK	Monitor Bracket
.272	MC	Medicine Cabinet
.273	MD	Mask Dispenser
.274	MDPE	Medium-Density Polyethylene
.275	MECH	Mechanical
.276	MESH/CLG	Mesh Ceiling
.277	MET/LIN	Metal Linear
.278	M/G	Make Good
.279	MGPNL	Medical Gas Panel
.280	MH	Manhole
.281	M/H	Mop Holder
.282	MHD	Mask Holder
.283	MHO	Magnetic Hold Open
.284	MIN	Minimum
.285	MIR	Mirror
.286	MIR/S	Mirror with shelf
.287	MISC	Miscellaneous
.288	mm	Millimetre
.289	MO	Masonry Opening
.290	mPa	millipascal

Acronyms and Abbreviations

.291	MPa	Megapascal
.292	MPI	Master Painters Institute
.293	M/PNL (MPNL)	Metal Panel
.294	M/RK	Magazine Rack
.295	MTC	Ministry of Transportation and Communications, Ontario
.296	MTL	Metal
.297	NAT	Natural
.298	NC	Narcotic Cabinet
.299	NEBB	National Environmental Balancing Bureau
.300	NEMA	National Electrical Manufacturers Association
.301	NFC	National Fire Code of Canada
.302	NFPA	National Fire Protection Association
.303	NIC	Not in Contract
.304	N/O	Normally Open
.305	No.	Number
.306	NPS	Nominal Pipe Size
.307	NRCC	National Research Council of Canada
.308	NS	Nursing Station
.309	NTP	Network Time Protocol
.310	NTS	Not to Scale
.311	NUR	Nutrition
.312	N/C	Normal Close
.313	N/O	Normal Open
.314	OAA	Ontario Association of Architects
.315	OBC	Ontario Building Code
.316	OC	On Centre
.317	OD	Outside Diameter
.318	OFF	Office
.319	OFNR	Optical Fiber, Nonconductive, Riser
.320	OGCA	Ontario General Contractors Association
.321	OHSA	Occupational Health and Safety Act (Ontario)
.322	ONVIF	Open Network Video Interface Forum
.323	OIRCA	Ontario Industrial Roofing Contractors Association

Acronyms and Abbreviations

.324	O & M	Operations and Maintenance
.325	ONE WAY	One-Way Glass
.326	OPSS	Ontario Provincial Standard Specification
.327	OR	Operating Room
.328	ORCI	Owner Removed, Contractor Installed
.329	OSCI	Owner Supplied, Contractor Installed
.330	OSDP	Open Supervised Device Protocol
.331	OSOI	Owner Supplied, Owner Installed
.332	OWSJ	Open Web Steel Joists
.333	Pa	Pascal
.334	PA	Public Amenities
.335	P/BRK	Paper Bracket
.336	P/C	Privacy Curtain
.337	P/CAB	Presentation Cabinet
.338	PCD	Paper Cup Dispenser
.339	PCI	Prestressed/ Precast Concrete Institute
.340	P/CON	Precast Concrete
.341	P/CT	Plastic Coating
.342	3PDT	3 Pole Double Throw
.343	PEW	Portable Eye Wash
.344	PF	Protective Flooring
.345	PGB	Pegboard
.346	PHAR	Pharmacy
.347	PHP	Phenolic Panel
.348	PIB	Polyisobutylene
.349	PLAM	Plastic Laminate
.350	PLAS	Plaster
.351	P/LKR	Purse Locker
.352	PLIFT	Patient Lift
.353	PLYWD	Plywood
.354	PM/RK	Pamphlet/Magazine Rack
.355	POE	Power Over Ethernet
.356	POR	Porcelain

Acronyms and Abbreviations

.357	PORC/T	Porcelain Tile
.358	POSN	Position
.359	PP	Push Plate
.360	PR	Procedure Room
.361	P/RK	Pamphlet Rack
.362	PR/PT	Prime Paint
.363	PRES.VEST	Pressurized Vestibule
.364	PROF	Profile
.365	PROJ	Project
.366	PR/SC	Projection Screen
.367	Psf	pounds per square foot
.368	PT	Paint
.369	PTD	Paper Towel Dispenser
.370	PTD/R	Paper Towel Dispenser/Receptor
.371	P/TEL	Pay Telephone
.372	P/TER	Precast Terrazzo
.373	PTR	Paper Towel Receptor
.374	PTS	Pneumatic Tube Station
.375	PTS/R	Pneumatic Tube Riser
.376	PVA	Polyvinyl acetate
.377	PVC	Polyvinyl chloride
.378	PVC-u	Unplasticised PVC
.379	PVDF	Polyvinylidene fluoride
.380	PTZ	Pan, Tile, and Zoom
.381	QRY	Quarry Tile
.382	R	Radius
.383	RAIC	Royal Architectural Institute of Canada
.384	RBR	Rubber Sheet
.385	RBR/T	Rubber Tile
.386	RCPT	Receptacle
.387	RCDD	Registered Communications Distribution Designer
.388	RD	Roof Drain
.389	REFR	Refrigerator

Acronyms and Abbreviations

.390	RB	Resilient Floor Base
.391	REV	Revision
.392	REX	Request to exit motion detection
.393	RF	Radio Frequency
.394	R/GL	Reflective glass
.395	RH	Robe Hook
.396	RH/S	Robe Hook Strip
.397	RHP	Radiant Heat Panel
.398	RI	Riser
.399	RLS	Roller Shade
.400	RM	Room
.401	RPM	Revolutions Per Minute
.402	RoHS	Restriction of Hazardous Substances
.403	RSF	Resilient Sheet Floor
.404	R/SU	Rod and Shelf Unit
.405	RWL	Rainwater Leader
.406	SAE	Society of Automotive Engineers
.407	S/BRH	Scrub Brush Holder
.408	SBS	Styrene-Butadiene-Styrene
.409	SC	Solid Core Wood
.410	S/C	Sharps Container
.411	SCC	Sprinkler Control Cabinet
.412	S/CONC	Sealed Concrete
.413	SD	Soap Dispenser
.414	SDH	Soap Dish
.415	SECT	Section
.416	SEER	Seasonal Energy Efficiency Ratio
.417	SER	Services
.418	SF	Soffit
.419	SGC	Sealed Concrete with Anti-Graffiti Coating
.420	S/GL	Spandrel Glass
.421	SH/C	Shower Curtain
.422	SH/CD	Shower Caddy

Acronyms and Abbreviations

.423	SH/H	Shower Head
.424	SHLF	Shelf
.425	SH/R	Shower Rod and Curtain
.426	SH/S	Shower Seat
.427	SI	Systeme International
.428	SIM	Similar
.429	SM	Square Metres
.430	SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
.431	SND	Sanitary Napkin Dispenser
.432	SND/PNL	Sound Absorption Panel
.433	SNR	Sanitary Napkin Receptor
.434	SP	Spandrel Panel
.435	SPDT	Single Pole Double Throw
.436	SPEC	Specification
.437	SPL	Special Coating
.438	SPL/S	Specialty Shelf
.439	SS	Solid Surfacing Material
.440	SSP	Surgery Support
.441	SSS	Stainless Steel Shelf
.442	SST	Stainless Steel
.443	ST	Steel
.444	STC	Sound Transmission Class
.445	STN	Stone
.446	STOR	Storage
.447	STR/U	Storage Unit
.448	STR	Structural
.449	TB	Tackboard
.450	TBD	To Be Determined
.451	TB/S	Tackboard Strip
.452	TB/WB	Tackboard / Whiteboard
.453	TBR	Toilet Back Rest
.454	TD	Towel Dispenser
.455	TDGA	Transportation of Dangerous Goods Act

Acronyms and Abbreviations

.456	TDH	Tongue Depressor Holder
.457	TEFC	Totally Enclosed, Fan Cooled
.458	TEMP/GL	Tempered Glass
.459	TEMP	Tempered
.460	TER	Terrazzo
.461	TEST	Testing Room
.462	TEX FIN	Textured Finish
.463	T & G	Tongue and Groove
.464	TIA	Telecommunications Industry Association
.465	TI/GL	Tinted Glass
.466	TLS	Transport Layer Security
.467	TME	To Match Existing
.468	T/MIR	Transparent Mirror (One Way Mirror)
.469	TPH	Toilet Paper Holder
.470	TR	Towel Rod
.471	TRAN	Transparent
.472	TRD	Tread
.473	TRM	Treatment Room
.474	TRR	Temperature Rise Rated
.475	TSSA	Technical Standards and Safety Authority
.476	TSD	Toilet Seat Dispenser
.477	TTMAC	Terrazzo, Tile and Marble Association of Canada
.478	TV/BRK	Television Bracket
.479	TYP	Typical
.480	U/C	Undercut
.481	UC/REFR	Undercounter Refrigerator
.482	ULC	Underwriters' Laboratories of Canada
.483	ULI	Underwriters' Laboratories Incorporated
.484	URP	Ultra Rock Panel
.485	U/S	Underside
.486	UT	Utility
.487	UTP	Unshielded Twisted Pair
.488	UV	Ultraviolet

Acronyms and Abbreviations

.489	VAC	Volts Alternating Current
.490	VAR	Vapour/Air Retarder
.491	VBX	View Box
.492	VCT	Vinyl Composition Tile
.493	VDC	Volt Direct Current
.494	VEST	Vestibule
.495	VHB	3M trademark
.496	VHD	Visor Holder
.497	VLAN	Virtual Local Area Network
.498	VNL	Vinyl Sheet
.499	VOC	Volatile organic compound
.500	VSS	Video Surveillance System
.501	WAP	Wireless Access Point
.502	WB	White Board
.503	WBS	Work Breakdown Structure
.504	W/COV	Wall Covering
.505	WC/WR	Wheelchair Washroom
.506	WD	Wood (solid)
.507	WDMA	Wood Door Manufacturers Association
.508	WDP	Wood Panel
.509	WDR	Wide Dynamic Range
.510	WDS	Wood Slat
.511	WGL	Wired Glass
.512	WHMIS	Workplace Hazardous Materials Information System
.513	WHI	Warnock Hersey Inc.
.514	WIN/C	Window Covering
.515	WKSP	Workshop
.516	WM	Wire Mesh
.517	W/m	Watt
.518	WP	Wall Protection
.519	WPF	Waterproof Flooring
.520	WPM	Waterproofing Membrane
.521	WR	Washroom

Acronyms and Abbreviations

.522 WTR Waiting Room
.523 WV Wood Veneer

PART 2- PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Quality Requirements

PART 1 - GENERAL

1.1 Section Includes

- .1 *Contractor's* quality assurance program.
- .2 *Contractor's* field quality control.
- .3 Subcontractor Qualification Statements
- .4 Independent inspection and testing – *Owner's* Quality Assurance.
- .5 Inspection and testing schedule.
- .6 Reports and documents.
- .7 Manufacturer's field review.
- .8 Mock-ups.

1.2 Contractor's Quality Assurance Program

- .1 Submit to the *Owner* and the *Consultant* for their information, a quality assurance program (the "Quality Assurance Program").
- .2 The Quality Assurance Program shall meet the requirements of Canadian Standards Association CSA CAN3-Z299.3 or such other requirements as set out in the *Contract Documents*.
 - .1 The Quality Assurance Program shall be designed so that quality requirements are obtained by progressive implementation of the controls and inspection functions stated in the Quality Assurance Program.
 - .2 Make any modifications to the Quality Assurance Program as reasonably requested by the *Owner* and/or the *Consultant*.
 - .3 The Quality Assurance Program shall include, but shall not be limited to, the following:
 - .1 A system by which changes to the *Contract Documents* and correspondence with *Subcontractor* and other correspondence is handled in a controlled manner.
 - .2 A system for purchased or manufactured materials to be identified, inspected to the specified standard, and covered by a material test report.
 - .3 A system by which measuring and testing equipment is properly stored, handled, and calibrated to a known standard.
 - .4 A system by which incoming materials are: inspected to the specified standard; accepted; allocated safe storage; and properly recorded.
 - .5 A system by which process inspection requirements shall be clearly stated for operations and carried out by qualified personnel.
 - .6 A system by which final inspections will be carried out and accepted by authorized personnel prior to release for shipping or major assembly.

Quality Requirements

- .7 A system by which non-conformance to requirements of the *Contract Documents* shall be recorded and solutions proposed by the *Owner* or the *Consultant* are also recorded.
- .8 A system by which instructions for handling and storage of equipment shall be given.
- .9 A system by which SBO items can be inspected and received in a manner which allows replacement or correction.
- .10 A system by which a record of quality inspections, tests, and actions shall be kept, including field quality control.
- .11 A system by which the *Owner* and the *Consultant* shall be afforded access to manufacturing areas and quality records and issued with copies of pertinent drawings and manufacturing schedules.
- .3 Provide the *Owner* and the *Consultant* with regular Quality Assurance Reports for their information according to an agreed schedule.

1.3 Contractor's Field Quality Control

- .1 Provide and be responsible for field quality control throughout the *Work*, including quality control of *Subcontractors* and major *Suppliers*.
- .2 Ensure that the only specified or approved *Products* and materials are used.
- .3 Provide and maintain an effective quality control program, in accordance with the Quality Assurance Program, and perform inspections and tests to ensure compliance with *Contract Documents*.
- .4 Furnish appropriate facilities, instruments, and testing devices required for performance of the quality control function.
- .5 Deliver inspection testing reports or approvals in accordance with the requirements of Section 01 45 00.
- .6 Develop a field quality control manual covering field installation. The form of the manual shall be acceptable to the *Owner* and the *Consultant*. This manual will document field quality control practices of the *Contractor*, *Subcontractors*, and major *Suppliers*. The manual shall include, but not be limited to:
 - .1 Concrete slab moisture and pH testing and surface preparation, including flatness and levelness.
 - .2 Surface preparation.
 - .3 Fastener and anchor installation.
 - .4 Material compatibility testing.
 - .5 On line fabrication quality control practices.
 - .6 Shipping.
 - .7 Field installation.
 - .8 Field inspection and testing by *Contractor*.

Quality Requirements

- .9 Field inspection and testing independent.
- .7 Inspection and testing shall be performed by company qualified to perform the inspections or tests specified or required by the building code, regulations, by-laws, or authorities having jurisdiction.
- .8 Retain and pay for inspection and testing that is for *Contractor's* own quality control or is required by regulatory requirements
- .9 Maintain a logbook (copies to be provided to the *Consultant* at completion of fabrication) documenting date, time, results, and significance of in-plant testing carried out, where applicable, linked to daily production. The form of this logbook shall be acceptable to the *Owner* and the *Consultant*.

1.4 Subcontractor Qualification Statements

- .1 Upon request by the *Consultant*, submit proof, in the form of CCDC 11 - Contractor's Qualification Statement, of qualifications of *Subcontractors* to verify *Subcontractor's* qualifications and experience meet or exceed the requirements of the *Contract Documents*.
 - .1 If, upon review of the Contractor's Qualification Statement, it is found that the *Subcontractor* does not meet the qualification requirements specified in the *Contract Documents* pertaining to the parts of the *Work* for which the *Subcontractor* has been retained, the *Contractor* shall replace the unqualified *Subcontractor* with a qualified *Subcontractor*, satisfactory to the *Contractor* and the *Owner*, at no additional cost to the *Owner* and at no increase in the *Contract Time*.

1.5 Independent inspection and Testing – Owner's Quality Assurance

- .1 Independent inspection and testing services are used by the *Owner* to verify compliance with requirements of the *Contract Documents*.
- .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 Independent inspection and testing services do not relieve the *Contractor* of responsibility for normal shop and site inspection, and quality control of manufacturing and installation.
 - .2 Specified tests, inspections, and related actions do not limit the *Contractor's* other quality assurance and control procedures that facilitate compliance with the *Contract Documents* requirements.
 - .3 Requirements for the *Contractor* to provide quality control services required by the *Contract Documents*, *Consultant*, *Owner*, or authorities having jurisdiction are not limited by *Owner's* independent inspection and testing services.
 - .4 Inspections and tests specified or required that are not specified as independent inspection and testing are the responsibility of the *Contractor* and are not covered under the *Owner's* quality assurance requirements.
- .3 The *Consultant* will, on behalf of *Owner*, appoint independent inspection and testing companies, representing, reporting and responsible to the *Owner* through the *Consultant*.

Quality Requirements

- .1 Cost of independent inspection and testing company services will be authorized as a disbursement from Cash Allowance as specified in Section 01 21 00. Independent inspection and testing company shall submit monthly invoice original to *Contractor* for review, relating invoices to tests and inspection reports. Provide original receipts for disbursements. Invoices for independent inspection and testing services shall be forwarded by *Contractor* to *Consultant* for inclusion in progress payment application.
- .4 Additional inspection and testing required because of changes in materials proposed by *Contractor* or *Subcontractors*, by lack of proper notice for inspection and testing specified, or required as a result of failure of such materials to meet requirements of the *Contract Documents* when originally tested, shall be carried out at no additional cost to the *Owner*.
- .5 Inspection and testing required by codes or ordinances, or by an authority having jurisdiction, and made by a legally constituted authority, shall be the responsibility of the *Contractor* and shall be paid for by the *Contractor*, is not part of the *Owner's* quality assurance requirements, and shall not be paid by *Owner*, unless otherwise specified in the *Contract Documents*.
- .6 Inspection or testing performed exclusively for *Contractor's* convenience shall be sole responsibility of *Contractor*, is not part of the *Owner's* quality assurance requirements, and shall not be paid by *Owner*.
- .7 Independent inspection and testing shall be performed by company qualified to perform the inspections or tests specified or required.
- .8 Requirements of regulatory companies:
 - .1 Testing shall be conducted in accordance with requirements of the building code.
 - .2 Obtain certification where required by the building code and standards.
- .9 Cooperation with independent inspection and testing companies:
 - .1 Provide independent inspection and testing companies with materials and installation information as required and/or requested.
 - .2 Submit test samples required for testing.
 - .3 Cooperate with independent inspection and testing companies and give adequate notification of any changes in source of supply, additional work shifts, and other proposed changes.
 - .4 Provide access to the *Work* for independent inspection and testing companies wherever the *Work* is in progress, or wherever *Products*, materials, or equipment are stored prior to shipping.
 - .5 Provide labour, *Construction Equipment*, and temporary facilities required to assist independent inspection and testing companies in sampling and making tests.
- .10 Inspection and test specimens
 - .1 Inspection and testing will, generally, consist of procedures listed in the following paragraphs, but additional tests may be performed as required to verify conformance to *Contract Documents*.

Quality Requirements

- .2 Specimens and samples for testing, unless otherwise specified in the *Contract Documents*, shall be taken by the independent inspection and testing company; sampling equipment and personnel shall be provided by the independent inspection and testing company; and deliveries of specimens and samples to the testing company shall be performed by the testing company unless otherwise specified.
- .3 Independent inspection and testing company shall take samples necessary to verify quality as specified. Taking of samples shall not endanger the structure or life safety, and shall be taken so as to best represent the *Work* as a whole.
- .4 Samples shall be handled, packaged, stored and delivered in accordance with specified tests. Sample handling where required shall duplicate conditions at the *Place of the Work* (such as site-cured concrete cylinders).
- .11 Where evidence exists that defective workmanship may have occurred, or that the *Work* may have been carried out incorporating defective materials, or where tests demonstrate that installed conditions do not comply with the requirements of the *Contract Documents*, the *Consultant* reserves the right to have additional inspections, tests, analysis, and surveys performed in order to help determine the extent of defect and whether such work must be replaced. Inspections, tests, and surveys carried out under these circumstances will be made at the *Contractor's* expense, and will not be paid by *Owner*, unless the results indicate that the work so tested, inspected or surveyed is not defective or that, in *Consultant's* opinion, the work so tested, inspected, or surveyed may be accepted, in which case tests, inspections or surveys will be paid by *Owner*.
- .12 Repair work damaged as a result of independent inspection and testing work.

1.6 Inspection and Testing Schedule

- .1 Prepare schedule for inspection and testing company services in accordance with Section 01 32 00 and as follows:
 - .1 Establishing schedule:
 - .1 By advance discussion with the selected independent inspection or testing company, determine the appropriate time necessary to perform the required services and to issue related reports.
 - .2 Allow for required time within construction schedule.
 - .2 Adherence to schedule:
 - .1 *Contractor* shall advise independent inspection and testing companies in advance when inspection and testing of the *Work* is required.
 - .1 Amount of advance notice shall be as required by the independent inspection and testing company, but shall be no less than 2 *Working Days*.
 - .2 When independent inspection and testing company is ready to perform inspection and testing according to predetermined schedule, but is prevented from inspection and testing or taking specimens due to incompleteness of the parts of the *Work* scheduled for inspection and testing, extra costs for inspection and testing attributable to the delay may be back-charged to *Contractor* at no additional cost to the *Owner*.

Quality Requirements

- .3 Notify independent inspection and testing company at least 3 *Working Days* before work required to be inspected commences, and arrange for a meeting at the *Place of the Work*, to be held 1 *Working Day* before the work starts with the following present:
 - .1 The *Contractor*, and the *Subcontractor* responsible for the work to inspected and/or tested, the inspection and testing company representatives, the product manufacturer's representative when required, and the *Consultant*.
- .4 For inspection and testing required by *Contract Documents* or by authorities having jurisdiction, provide *Consultant* and inspection and testing agencies with timely notification in advance of required inspection and testing.
- .5 Give 2 *Working Days*' prior notice to independent inspection and testing company of the commencement of each phase of the *Work* requiring inspection, and provide independent inspection and testing company with materials and installation information.

1.7 Reports and Documents

- .1 Inspection and testing company, whether for Owner's quality assurance or for *Contractor's* quality assurance, shall submit shop inspection and site inspection reports within 5 *Working Days* of each inspection.
- .2 Distribute reports digitally as follows:
 - .1 *Owner*.
 - .2 *Consultant*.
 - .3 *Contractor*.
 - .4 Consulting engineers, as applicable.
- .3 Inspection and testing companies, whether for *Owner's* quality assurance or for *Contractor's* quality assurance, shall submit a written report for each inspection or test, including pertinent data such as conditions at the *Place of the Work*, dates, test references, locations of tested materials, actual *Product* identification, testing methodology, procedures, and descriptions, site instructions given, recommendations and/or any other information required by standard applicable to reporting of tests and inspections.
 - .1 Report shall clearly indicate failure of *Product* or procedures to meet applicable standards, give recommendations for retesting or correction. Inspector shall contact *Contractor* and *Consultant* immediately when *Product* or assembly fails to meet requirements of the *Contract Documents*.
- .4 Upon completion of portions of the *Work* subject to inspection and testing, whether for *Owner's* quality assurance or for *Contractor's* quality assurance, submit to the *Consultant* duplicate certificates of acceptance of the installation issued by the inspection and testing company.

Quality Requirements

1.8 Manufacturer's Field Review

- .1 Where manufacturer's field review is specified, manufacturer's representative shall review the relevant parts of the *Work* at the *Place of the Work*, or wherever such affected work is in progress, to verify that the relevant parts of the *Work* are being executed in accordance with manufacturer's written requirements and verify their product is fit for the purpose intended.
- .2 Manufacturer's field review is to verify that the *Products* specified are being used in the *Work* and are being applied on surfaces prepared in accordance with manufacturer's written requirements and the requirements of the *Contract Documents*.
- .3 Unless otherwise indicated, manufacturer's representative shall undertake a minimum of 3 field reviews, with additional reviews as required by the manufacturer, to verify that the relevant parts of the *Work* are in accordance with the manufacturer's written requirements.
- .4 Manufacturer's representative shall submit a type-written report on manufacturer's letterhead after each field review following procedures for reports and documents specified in Section 01 45 00. Report shall document manufacturer's representative's field observations and recommendations.

1.9 Mock-Ups

- .1 Provide field or shop erected example of work complete with specified materials and workmanship.
- .2 Provide field or shop erected mock-ups of *Work* as specified in the *Specifications*. If a mock-up location is not indicated in the *Drawings* or *Specifications*, locate where directed by *Consultant*.
- .3 Do not proceed with work for which mock-ups are required prior to *Consultant's* review of mock-ups.
- .4 Modify mock-up as required until *Consultant* written acceptance is obtained.
- .5 Protect and maintain mock-ups until directed to be removed.
- .6 Commence work demonstrated in mock-up only after review and acceptance of workmanship.
- .7 Remove mock-ups only when the *Work* they represent is complete or when otherwise directed by *Consultant*.
- .8 If possible, mock-up may become part of finished work, at sole discretion, and with prior written acceptance of *Consultant*.
- .9 Reviewed and accepted mock-ups shall be the standard of workmanship and material against which installed work will be compared.
- .10 Remove and replace materials or assemblies appearing in the finished work that do not match reviewed and accepted mock-ups.

PART 2 - PRODUCTS

Not applicable.

Quality Requirements

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Temporary Facilities & Controls

PART 1 - GENERAL

1.1 General Instructions

- .1 Temporary facilities and controls specified in this section shall be supplemented as applicable in accordance with Section 01 35 13.
- .2 Arrange, obtain and pay cost for permits required for temporary facilities and controls.
- .3 *Provide* and maintain temporary facilities and controls for the *Work* and remove them from the *Work* upon issuance of certificate of *Substantial Performance of the Work*.
- .4 Arrange and pay for required temporary services, unless otherwise indicated by *Consultant*.
- .5 Protect and maintain without interruption, existing water, heating, drainage, telephone and other services within the *Place of the Work* to existing buildings not within the scope of the *Work* of this *Contract*. Obtain written permission of the *Owner* for services required to be temporarily shut off, at least 2 full *Working Days* in advance.
- .6 Do not use permanent conveying, mechanical, or electrical systems, except standpipe for firefighting, during the course of the *Work* unless specific written permission is provided by the *Consultant*. Use of permanent facilities or services for temporary construction service shall not prejudice warranties.
- .7 *Provide* connection and disconnection of temporary services and facilities required in the *Work*, including connection to existing services made available by the *Owner*.

1.2 Existing Services and Facilities

- .1 Do not use any existing services and facilities during construction unless specific written permission is provided by *Owner*.

1.3 Temporary Electrical Services

- .1 *Provide* and maintain an adequate temporary electrical service for performance of the *Work* including, but not limited to, operation of electric pumps, motors, vibrators and other power tools, hoisting and related construction and general illumination during the *Work*.
 - .1 Use existing power, subject to *Owner's* approval.
- .2 *Provide* and maintain any components and equipment necessary to transform supply power to necessary temporary power voltage.

1.4 Temporary Water Supply

- .1 *Provide* and maintain a temporary supply of water for use in the *Work*.
 - .1 Use existing water supply, subject to *Owner's* approval.
- .2 Extend supply pipe or pipes from nearest available sources and maintain in good condition until permanent system is installed and ready for use.

Temporary Facilities & Controls

1.5 Temporary Sanitary Facilities

- .1 Temporary sanitary facilities shall be in accordance with Section 01 35 13.

1.6 Temporary Site Offices

- .1 Temporary site office shall be in accordance with Section 01 35 13.

1.7 Temporary Telephone, and Computer

- .1 *Provide* and maintain a telephone in temporary site office for exclusive use of *Consultant*, *Contractor*, and *Subcontractors*. Pay phone is not acceptable.
- .2 Superintendent shall be equipped with mobile telephone device.
- .3 Long distance charges shall be paid by party making call.
- .4 *Provide* and maintain internet access for the *Consultant*, *Owner*, and other guests through a high bandwidth Wi-Fi hub capable of supporting traffic with 50 connected devices simultaneously; provide for the use of the *Consultant* a Wi-Fi enabled colour printer capable of printing 11" x 17" format.

1.8 Temporary Heating and Ventilation

- .1 *Provide* and pay for temporary heating, cooling and ventilating required for the *Work*, including attendance, maintenance and fuel.
- .2 *Provide* temporary heat and ventilation as required to:
 - .1 Facilitate continuous uninterrupted progress of the *Work*.
 - .2 Protect the *Work* and *Products* against damage and defacement caused by weather, harmful levels of temperature, humidity, and moisture.
 - .3 Provide ambient temperatures and humidity levels for proper storage, installation and curing of materials, in accordance with specified standards and manufacturer's requirements.
 - .4 Provide adequate ventilation to meet health regulations for safe working environment.
- .3 Prior to enclosing building, maintain work areas at not less than 7°C. After enclosing, keep premises heated to at least 13°C using temporary heating devices that do not cause moisture and humidity build-up within the facility. Increase temperatures in isolated areas to 20°C as required by various sections of the specifications or by *Product* manufacturers.
- .4 Solid fuel salamanders will not be permitted.
- .5 *Provide* temporary heat or adequate protection by means of straw or other coverings to floor slabs, footings, or any part of building not specifically designed to withstand frost penetration.
- .6 Furnish other temporary heating as required by various sections of the specifications or by *Product* manufacturers.
- .7 Replace with new, any work damaged due to failure to provide adequate heat at no cost to *Owner*.

Temporary Facilities & Controls

1.9 Temporary Enclosures and Protection

- .1 *Provide* temporary enclosures and protection of adequate construction to prevent dispersion of dust and dirt into other areas of existing building and to prevent dispersion of dust and dirt beyond the *Place of the Work*.
- .2 *Provide* temporary weather-tight enclosures and protection for exterior openings in building as soon as walls, floors and roofs are built so as to protect the *Work* from weather and vandalism. *Provide* doors in enclosures as necessary to maintain fire exits.
- .3 Temporary enclosure and protection shall be of finished appearance and painted to colour approved by *Owner*.
- .4 Provide dust seal and sound resistant enclosures to protect existing building and operations as indicated. Include temporary doors, fastenings and keys.
- .5 Insulate and airseal exterior enclosures to prevent condensation and drafts.
- .6 Supplement these requirements in accordance with Section 01 35 13.

1.10 Signs and Notices

- .1 Project sign:
 - .1 Design and erect a 1220 x 2440 mm (4' x 8') free standing project sign including overlaid plywood, backing posts, post foundations, framing and installation.
 - .2 Sign shall contain information regarding the project, *Owner*, *Consultant*, *Contractor* and other information as required.
 - .3 Company logos can be added to the project sign.
 - .4 Sign shall be professionally finished according to the design provided by *Consultant*.
 - .5 Location of sign: In prominent location to *Consultant's* acceptance.

1.11 Plant, Machinery and Scaffolding

- .1 *Provide* formwork, scaffolding, equipment, tools, machinery, including lifts, and incidental appurtenances necessary for the proper execution of the *Work*.
- .2 Erect plant, machinery and scaffolding to permit access to building and the *Work*.
- .3 Use scaffolds in such manner as to interfere as little as possible with other trades' operations.
- .4 Support scaffolds from finished surfaces only after taking precautions to prevent damage. No supports, clips, brackets, or similar devices shall be welded, bolted, or otherwise affixed to any finished member or surface without prior permission.

1.12 Site Storage

- .1 Handle and store materials so as to prevent damage or defacement to the *Work* and surrounding property.

Temporary Facilities & Controls

- .2 Construct weather-tight storage sheds for storage of materials that may be damaged or defaced by weather. *Provide* floors raised 150 mm (6") clear of ground for storage of *Products*.
- .3 *Owner* is not responsible for securing *Products* or materials at the *Place of the Work*.

1.13 Protection of the Public

- .1 *Provide* fencing, barricades, hoarding, notices and warning boards and maintain lights and signals for protection of workers engaged on the *Work*, for protection of adjoining property and for protection of the public.
- .2 Such protective measures shall be finish painted to *Owner's* approved colour, when visible to the public.
- .3 Where any special hazard exists from which it is not possible to protect the public safety by other means, watchpersons shall be employed to preserve public safety until the area of special hazard no longer poses a risk to public safety.

1.14 Protection of the Work

- .1 Protect the *Work* from damage, discolouring, and defacement. Maintain protection until the *Work* is complete.
- .2 Protect completed work from soiling, abrasion, punctures, damage, and defacement, and maintain protection until the surrounding or overhead work is complete.
- .3 Keep surfaces free of oils, grease or other materials that may damage or deface them or affect bond of applied *Products*.
- .4 Remove and replace materials damaged or defaced as a result of failure to provide adequate protection.
- .5 Have damaged or defaced work corrected by workers meeting qualification requirements of the *Contract Documents*.
- .6 *Provide* minimum 3 mm thick Masonite board protection, or finish flooring manufacturer approved alternative, to all finished floors.
- .7 *Contractor* shall provide the *Consultant* a minimum of 15 *Working Days* prior written notice of the intent to drive vehicles or heavy equipment over finished floors or floor slabs and submit supporting data. Any shoring or other supplementary support required shall be provided by the *Contractor* at no increase in the *Contract Price* and at no additional cost to the *Owner*.

1.15 Protection of Foundations

- .1 In cold and freezing weather, prevent heaving of foundations due to freezing action of ground.

1.16 Temporary Drainage and Dewatering

- .1 The *Work* includes the removal of collected groundwater and surface water accumulating from precipitation and groundwater infiltration throughout the course of the *Work* until date of *Substantial Performance of the Work*.

Temporary Facilities & Controls

- .2 Keep drainage lines and gutters open. No flow of water shall be directed across or over pavements except through pipes or properly constructed troughs. Keep portions of the *Work* properly and efficiently drained during construction and until completion. Be responsible for 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 the *Work*, or due to operations which may cause water to flow elsewhere.
- .3 Keep trenches and other excavations free of water. Remove water in a manner that will prevent loss of soil, and maintain the stability of existing soils.
- .4 Dispose of such water in a manner that will not be hazardous to public health and safety, private property, or to the *Work*.
- .5 Drainage of trenches or other excavation through storm drainage pipe will be allowed only with the express permission of the authority having jurisdiction.
- .6 When drainage is permitted in writing to be directed to existing catch basins, regularly and at *Substantial Performance of the Work* inspect such catch basins and remove accumulated debris and sediment.

1.17 Snow Removal

- .1 Allow no accumulation of ice and snow within the *Place of the Work*. There shall be no use of salt for de-icing in areas of building work.
- .2 Remove snow from access routes to the *Work* to maintain uninterrupted progress of the *Work*.

1.18 Pest Control

- .1 *Provide* rodent control and other pest control programs during the *Work* in accordance with the requirements of authorities having jurisdiction.

1.19 Vehicle Cleaning

- .1 Establish a designated vehicle loading point at the *Place of the Work* on a gravel base to minimize tracking of soil off the *Place of the Work*. If the loading point becomes contaminated, it shall be cleaned and replaced.
- .2 Keep a daily log of each vehicle leaving the *Place of the Work*, including time of cleaning and name of cleaner.
- .3 Tarp vehicles containing indigenous soil or debris leaving the *Place of the Work*.

1.20 Waste Management

- .1 Do not bury rubbish and waste materials at the *Place of the Work*.
- .2 Do not dispose of waste into waterways or storm or sanitary sewers.
- .3 Do not burn waste materials at the *Place of the Work*.
- .4 Comply with waste disposal requirements of authorities having jurisdiction.
- .5 Remove waste material from the *Place of the Work* daily. If waste is collected in bins, bins to be removed from site once full.

Temporary Facilities & Controls

- .6 Arrange and pay for removal of debris and waste from the *Place of the Work*.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Pay fees.
- .8 Supplement these requirements in accordance with Section 01 35 13.

1.21 Control of Dust, Debris and Noise

- .1 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .2 Control dust and dirt produced during the *Work* to prevent dispersion beyond the immediate work areas.
- .3 Prevent materials from contaminating air beyond application area, by providing temporary enclosures and ventilation/filtration.
- .4 Limit noise levels in accordance with requirements of authorities having jurisdiction and the *Owner*.
- .5 Prevent abrasive-blasting, pressure-washing spray, and other extraneous materials from contaminating air beyond application area.
- .6 The surrounding buildings and campus are occupied year round. Pay special attention to control and minimization of dust, noise, and garbage. Protect surrounding site work and building cladding from damage during construction.
- .7 Supplement these requirements in accordance with Section 01 35 13.

1.22 Traffic Control and Road Maintenance

- .1 Do not block roads or impede traffic. Keep construction traffic to designated roads only. Provide flagperson to direct traffic as required.
- .2 Keep public and private roads free of dust, mud and debris resulting from truck, machinery and vehicular traffic related specifically to this *Project*, for the duration of *Work*.
- .3 Clean roads regularly, public or private. Wash down and scrape flush roads at least daily when earth moving operations take place. Maintain public property in accordance with requirements of authorities having jurisdiction.

1.23 Security

- .1 Provide security for the *Place of the Work* in accordance with Section 01 35 13.

1.24 Design and Safety Requirements for Temporary Facilities

- .1 Be responsible for design, erection, operation, maintenance and removal of temporary structural and other temporary facilities. Engage and pay for registered professional engineering personnel skilled in the appropriate disciplines to perform these functions where required by law or by the *Contract Documents*; and in cases where such temporary facilities and their method of construction are of such a nature that professional engineering skill is required to produce safe and satisfactory results.

Temporary Facilities & Controls

- .2 Engage and pay for professional engineer(s) registered in *Place of the Work* to design and supervise construction and maintenance of hoardings, covered ways, protective canopies and project sign(s). Designs provided by *Consultant* or *Owner* for such work cover general appearance only.

1.25 Moisture Control

- .1 Concrete slabs shall be properly cured and dried before installation of finished flooring assemblies.
 - .1 Allow for one of the following methods:
 - .1 Drying time.
 - .2 Drying action by mechanical methods.
 - .3 Moisture mitigation coating as specified below.
 - .4 Drying action by other method and/or materials as approved by affected flooring manufacturer.
- .2 Before installation of weather barriers, when materials are subject to wetting, protect as follows:
 - .1 Protect porous materials from water damage.
 - .2 Protect stored and installed material from flowing or standing water.
 - .3 Keep porous and organic materials from coming into prolonged contact with concrete.
 - .4 Remove standing water from decks.
 - .5 Keep deck openings covered or dammed.
- .3 After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture, protect as follows:
 - .1 Do not load or install gypsum board or other porous materials or components, or items with high organic content, into partially enclosed building.
 - .2 Keep interior spaces reasonably clean and protected from water damage.
 - .3 Periodically collect and remove waste containing cellulose or other organic matter.
 - .4 Discard or replace water-damaged material.
 - .5 Do not install material that is wet.
 - .6 Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- .4 After completing and sealing of the building enclosure but prior to the full operation of permanent heating, ventilation, and air conditioning systems, maintain as follows:
 - .1 Control moisture and humidity inside building by maintaining effective drying conditions.
 - .2 Use permanent heating, ventilation, and air conditioning system to control humidity subject to the prior written approval of the *Consultant*.

Temporary Facilities & Controls

- .3 Comply with manufacturer's written requirements for temperature, relative humidity, and exposure to water limits.

PART 2 - PRODUCTS

2.1 Moisture Mitigation Coating

- .1 100% solids epoxy one coat system, 0 VOC, suitable for application to 100% RH floors per ASTM F2170-18, designed to protect moisture sensitive adhered flooring systems from elevated moisture and alkalinity levels, warranted by manufacturer to cover subsequent flooring materials and labour, compatible with finish flooring products.
- .2 ASTM E96/E96M-10 water vapour transmission (wet methods) performance shall be documented by independent testing laboratory at a minimum 97% for water vapour transmission reduction compared to untreated concrete.
- .3 ASTM E96/E96M-10 perm rating shall not exceed a 0.10 Perm rating.
- .4 ASTM D1308-02(2013) insensitivity to alkaline environment up to, and including, pH 14 in a 14 day bath test.
- .5 Manufacturer certifies acceptance and exposure to continuous topical water exposure after final cure.
- .6 Water vapour reduction system shall be a single coat, stand alone system with no requirements for additional components such as sand broadcast for adhesion of flooring systems.
- .7 System shall reduce Calcium Chloride readings of up to 25lbs/1000 ft²/24 hrs by 97% in one coat. System must be able to perform as required with RH Probe readings of 100%.
- .8 Acceptable manufacturers that provide *Products* which are known to meet above performance criteria as follows:
 - .1 Koster American Corporation as distributed by DRE Industries.
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Moisture Mitigation Coating

- .1 Preparation and installation shall be in accordance with manufacturer's written requirements.
- .2 Field quality control:
 - .1 Conduct quality control in accordance with Section 01 45 00:
 - .1 Field tests and inspections:

Temporary Facilities & Controls

- .1 Test for moisture vapour transmission in accordance with ASTM F710-17 and ASTM F1869-16a or ASTM F2170-18 in accordance with manufacturer's written flooring installation requirements. Results must not exceed $170 \mu\text{g}/\text{m}^2$ (3 pounds per 1,000 square feet) in 24 hours when tested to ASTM F1869-16a, or exceed 75% when tested to ASTM F2170-18.
 - .2 Test for surface pH. Levels of pH shall not exceed the written recommendations of the flooring manufacturer and adhesive manufacturer. Test in accordance with ASTM F710-17.
 - .3 For each test type: Conduct 3 tests for flooring applications up to 93 m^2 (1000 square feet) in area, and 1 additional test for each additional 93 m^2 (1000 square feet) of flooring area.
 - .4 Testing shall be conducted by independent inspection and testing company and in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

PART 4

Hoarding

PART 1 - GENERAL

1.1 Permits

- .1 Arrange and pay for necessary permits for proper execution and completion of the work of this section.

1.2 Design

- .1 Design hoarding to meet bylaws and regulations of authorities having jurisdiction and obtain approvals from authorities having jurisdiction.
- .2 Engage and pay for professional engineer(s) registered in *Place of the Work*, experienced in this type of engineering, to design and supervise construction and maintenance of hoardings, covered ways, protective canopies and project sign(s). Designs included in the *Contract Documents* for such work cover general appearance only.
- .3 At *Contractor's* option, use one of the following hoarding systems, except as otherwise noted:
 - .1 Plywood and wood framed hoarding system.
 - .2 Post and chainlink hoarding system for site, civil and landscape. Include visual barrier.
- .4 Scope and approximate location of hoarding as indicated. Interior hoarding shall comply with CSA Z317.13-17.

PART 2 - PRODUCTS

2.1 Materials

- .1 Chain link hoarding:
 - .1 Fence fabric: 3.75 mm diameter (No. 9 gauge) steel wire woven in a 50 mm (2") mesh, hot dipped galvanized after weaving and knuckled finish top and bottom selvedge edges. Galvanized fabric to have a minimum zinc application of 490 g/m² of surface area.
 - .2 Posts: CLFMI (Chain Link Fence Manufacturer Institute) Type 1, standard butt-welded Schedule 40, ASTM F1083-96 standard weight, galvanized pipe.
 - .3 *Provide* prefabricated panelized chainlink and post galvanized metal hoarding system.
- .2 Plywood hoarding:
 - .1 *Provide* rough hardware required for the work of this section.
 - .2 Framing lumber and posts: Unless otherwise specified or indicated, NLGA No. 2 Construction SPF. Reused material may be used. Dimensions as follows, unless otherwise indicated or required by authorities having jurisdiction:
 - .1 Vertical posts: 89 mm x 89 mm.
 - .2 Horizontal rails: 39 mm x 89 mm.

Hoarding

- .3 Hoarding: Plywood, 1200 mm x 2400 mm (4' x 8') plywood in thickness of 13 mm (1/2"), sheathing grade conforming to CSA 0141-M1978. Reused material may be used.
- .4 Hoarding to be painted in accordance with Section 09 91 00. Colour to later selection by the *Consultant*.
- .3 Signage: *Provide* suitable sized notice signs at entrance to the *Place of the Work* with contrasting text "RESTRICTED ACCESS - CONSTRUCTION SITE" complete with the name of *Contractor*.
- .4 Silt control fabric: Geotextile membrane suitable for silt retention work.
- .5 Fencing mesh: Tensar mesh, square grid, safety colour.

PART 3 - EXECUTION

3.1 Erection

- .1 Erect framing members and install hoarding panels at the perimeter of the *Place of the Work* as indicated or required by authorities having jurisdiction to fully enclose the *Place of the Work* and as follows, unless otherwise indicated or required by authorities having jurisdiction:
 - .1 Height of hoarding: 2400 mm (8') minimum, unless otherwise indicated, above grade at any point.
 - .2 Vertical posts spaced 2400 mm (8') on centre, maximum.
 - .3 Horizontal rails securely nailed or screwed to vertical posts at top, bottom, and intermediate locations at 600 mm on centre.
 - .4 Erect panels around objects as required.
 - .5 Hoarding shall contain no opening more than 150 mm wide or less than 900 mm above the bottom of the fence except where required for access to and from the *Place of the Work*.
 - .6 *Provide* no rails, other horizontal or diagonal bracing, attachments, or pattern of openings on the outside that would facilitate climbing.
 - .7 At access openings: *Provide* gates that provide performance and safety at least equivalent to hoarding and contain wire mesh of sufficient openness to provide visibility for traffic entering or exiting the *Place of the Work*.
- .2 Paint plywood hoarding to *Owner's* approved colour, when visible to the public.
- .3 *Provide* overhead protection hoarding where public access is required.
- .4 *Provide* hoarding, access gates, access doors, in conformance with the *Contract Documents* and authorities having jurisdiction.

3.2 Hardware

- .1 *Provide* rough and finish hardware as required.

END OF SECTION

Product Requirements

PART 1 - GENERAL

1.1 Section Includes

- .1 Availability of *Products*.
- .2 *Product* handling.
- .3 *Product* requirements and quality.

1.2 Availability of Products

- .1 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*.
- .2 If a specified *Product* is no longer available, promptly notify the *Consultant*. The *Consultant* will take action as required.
- .3 In the event of delays in supply of *Products*, and should it subsequently appear that the *Work* may be delayed for such reason, *Consultant* reserves the right to substitute more readily available *Products* of similar character, at no additional cost to the *Owner*.

1.3 Product Handling

- .1 Handle and store *Products* in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturers' and *Supplier's* recommendations and so as to ensure preservation of their quality and fitness for the *Work*, and protect from vandalism and theft.
- .2 Store packaged or bundled *Products* in original and undamaged condition with manufacturer's seals and labels intact, facing to outside. Do not remove from packaging or bundling until required in the *Work*.
- .3 Store materials susceptible to environmental damage in a weathertight enclosure raised clear of ground so that they are protected from weather, dampness and deterioration. Do not use such materials which have been damaged by exposure to moisture.
- .4 Keep sand, when used as ingredients for grout, mortar or similar mixed materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .5 Store sheet materials, lumber and other *Products* susceptible to deterioration on flat, solid supports and keep clear of ground or slab. Slope to shed moisture.
- .6 Handle materials to preclude damaging existing surfaces and work of others.
- .7 Remove damaged *Products* and replace with new undamaged *Products*.
- .8 Transportation:

Product Requirements

- .1 Pay cost of transportation of *Products* required in performance of *Work*.
- .2 Transportation cost of *Products* supplied by *Owner* will be paid for by *Owner*. Unload, handle and store such *Products* at the *Place of the Work*.
- .3 Reject *Products* damaged during transport.
- .4 Transportation of *Products* must be undertaken to suit construction schedule. *Contractor* is responsible for determining mode of transport to ensure delivery, obtaining *Shop Drawings*, placement of orders, and on-time premium costs, air freight, and the like.

PART 2 - PRODUCTS

2.1 Product Requirements and Quality

- .1 Compatibility of options: If given option of selecting between two or more *Products*, select *Product* compatible with products previously selected, even if previously selected products were also options.
 - .1 Unless otherwise indicated in the *Contract Documents*, maintain uniformity of *Product* and manufacturer for any like item, material, equipment or assembly for the duration of the *Work*.
- .2 *Products* used for temporary facilities may have been previously used, providing they are sound in structural qualities.
- .3 *Products* and *Product* installation shall be in compliance with building code, regulations and requirements of authorities having jurisdiction.
- .4 Specified options: The *Work* is based on materials, *Products* and systems specified by manufacturer's catalogued trade names, references to standards, by prescriptive *Specifications* and by performance *Specifications*.
 - .1 Wherever a *Product* or manufacturer is specified by a single proprietary name, provide the named *Product* only.
 - .2 Wherever more than one *Product* or manufacturer is specified by proprietary name for a single application, provide any one of the named *Product*.
 - .3 Wherever a *Product* is specified by reference to a standard only, provide any *Product* that meets or exceeds the specified standard. If requested by *Consultant*, submit information verifying that the proposed *Product* meets or exceeds the specified standard.
 - .4 Wherever a *Product* is specified by descriptive 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 requirements.

Product Requirements

- .5 The onus is on the *Contractor* to prove compliance with governing published standards, prescriptive *Specifications* and with performance *Specifications*.
- .6 Visual selection *Specifications*:
 - .1 Where *Specifications* include the phrase "as selected by *Consultant* from manufacturer's full range" or similar phrase, select a product that complies with requirements. *Consultant* will select colour, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- .7 Visual matching *Specifications*:
 - .1 Where *Specifications* require "match *Consultant's* sample", provide a product that complies with requirements and matches *Consultant's* sample. *Consultant's* decision will be final on whether a proposed product matches.
- .5 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 Defective *Products*, whenever identified prior to completion of the *Work*, will be rejected, regardless of previous reviews. Review of the *Work* by the *Consultant* or independent inspection and testing companies does not relieve the *Contractor* of the responsibility for executing the *Work* in accordance with the requirements of the *Contract Documents*, but is a precaution against oversight or error.
- .6 Basis of design:
 - .1 Where *Contract Documents* list "basis of design", this indicates the *Product* or system that was used in the preparation of the design included in the *Contract Documents*, and which may be deemed as an acceptable *Product*.
 - .2 The basis of design establishes the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products from other manufacturers.
 - .3 This does not preclude the use of other *Products* or systems in the *Work*, provided the proposed *Product* or system complies with the design and performance requirements contained in the *Contract Documents*, and *Products* or systems proposed for use in the work that are not the named basis of design follow procedures for product substitutions specified under Section 01 25 00.

Product Requirements

- .7 Where *Contract Documents* require design of a *Product* or system, and minimum material requirements are specified, the design of such *Product* or system shall employ materials specified within applicable section. Where secondary materials or components are not specified, augment with materials meeting applicable code limitations, and incorporating compatibility criteria with adjacent work.
- .8 Should dispute arise as to quality or fitness of *Products*, the decision rests strictly with *Consultant* based upon the requirements of the *Contract Documents*.
- .9 *Products* exposed in the finished work shall be uniform in colour, texture, range, and quality, and be from one production run or batch, unless otherwise indicated.
- .10 *Owner* retains right to select from choices available within specified *Products* for colours, patterns, finishes or other options normally made available. Submit full range of *Product* options in accordance with Section 01 33 00 for such selection.
- .11 Exposed to weather: *Products* and materials in environments not protected by the building's HVAC and/or climate control systems shall be considered exposed to weather.

PART 3 – EXECUTION

Not applicable.

END OF SECTION

Examination and Preparation

PART 1- GENERAL

1.1 Section Includes

- .1 Examination of the *Place of the Work*, documents, surfaces and conditions.
- .2 Public utilities and services.
- .3 Setting out the *Work*.

1.2 Examination of the *Place of the Work*, Documents, Surfaces and Conditions

- .1 Examine the *Place of the Work* and investigate matters relating to the nature of the *Work*, means of access and egress, obstacles, rights and interests of other parties which may be interfered with during the execution of the *Work*, conditions and limitations including obstructions, existing structures or facilities, local conditions, actual levels, character and nature of the *Work*, documents related to existing building or buildings, as applicable and when available, and other consideration which may affect performance of the *Work*.
- .2 Examine the extent of work to be performed and matters which are referred to in the *Contract Documents* prior to start of the *Work*.
- .3 Examine work to which work is to be applied, anchored or connected, and relevant as-built conditions.
- .4 Each work operation following on a previous work operation of a differing *Subcontractor*, shall include a thorough examination of the condition of the previous work to verify that work is complete and in a condition suitable to receive the subsequent work. Conditions found unacceptable, either for the commencement of the new work or its satisfactory completion, shall be reported in writing to the *Consultant*.
- .5 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.
- .6 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.
- .7 Do not commence work until unsatisfactory conditions are corrected. Commencement of work shall mean acceptance of surfaces, tolerances, and conditions, and existing conditions will not be accepted as a contributing factor to subsequent failure or unacceptability of the *Work*.
- .8 Work adjacent to public property:
 - .1 Verify before commencing portions of the *Work* adjacent to public and private properties, that no plans for altering clearances, set-backs, easements, grades, or otherwise have been established by authorities having jurisdiction, subsequent to issuance of the building permit.
 - .2 Notify *Consultant* of any such plans that will affect the *Work* and proceed as directed by *Consultant*.

Examination and Preparation

1.3 Public Utilities and Services

- .1 Prior to commencement of the *Work* at the *Place of the Work*, verify limitations imposed on the *Work* by presence of utilities and services, and cause no damage to them as a result of the *Work*.
- .2 Before commencing excavation, drilling or other earthwork, establish or confirm location and extent of existing underground utilities and structures at the *Place of the Work*.
- .3 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.
- .4 Notify service authorities concerned so that they may protect, remove, relocate, or discontinue existing utilities and services, as they may require.
- .5 Record locations of maintained, re-routed, and abandoned utility lines.

1.4 Setting Out the *Work*

- .1 Assume full responsibility for and execute complete layout of the *Work* to required locations, lines and elevations.
- .2 Arrange meeting with *Consultant* to discuss critical setting out assumptions for the *Work* and establish limiting conditions for setting out the *Work*. *Consultant* shall chair and prepare minutes of the meeting, and prepare and submit sketches recording understanding of key setting out principles.
- .3 Provide devices needed to lay out and construct the *Work*.

PART 2 - PRODUCTS

Not applicable.

PART 3 – EXECUTION

Not applicable.

END OF SECTION

Execution

PART 1 - GENERAL

1.1 Section Includes

- .1 Inserts, anchors, and fasteners.
- .2 Penetrations.
- .3 Concealed services.
- .4 Trademarks and labels.
- .5 Interferences.
- .6 Publicity releases and photographs.
- .7 Manufacturer's instructions.
- .8 Galvanic/dissimilar metal corrosion.
- .9 Workmanship.
- .10 General construction tolerances.

1.2 Inserts, Anchors, and Fasteners

- .1 Use only factory made, threaded or toggle type inserts as required for supports and anchors, properly sized for load to be carried.
- .2 Where inserts cannot be placed, use factory made expansion shields for light weights only.
- .3 Supply and locate inserts, holes, anchor bolts and sleeves during placement or fabrication of structural elements.
- .4 Fasteners stressed in withdrawal are not acceptable, except where otherwise indicated.
- .5 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to prevent direct contact.
- .6 Use non-corrosive fasteners and anchors for securing exterior work and in spaces where high humidity levels are anticipated.
- .7 Space anchors within individual load limit or shear capacity and install such that they provide positive permanent anchorage.
- .8 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .9 Fastenings for prefinished materials shall be of concealed type unless otherwise indicated, and when exposed finish is required, of matching prefinishing materials.
- .10 Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.
- .11 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .12 Bolts shall not project more than one diameter beyond nuts.

Execution

- .13 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials being fastened.
- .14 Power actuated fasteners:
 - .1 Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E1190-11 conducted by a qualified independent testing agency.
 - .2 Do not use power actuated fasteners which are stressed in withdrawal in finished work.
 - .3 Do not use power actuated fasteners within 100 mm (4") of the edge of concrete or masonry, unless otherwise accepted in writing by *Consultant*.
 - .4 Do not use power actuated fasteners in post-tensioned concrete.

1.3 Penetrations

- .1 Holes or voids created in assemblies or partitions for penetrating mechanical, electrical, or sprinkler service items, shall be of sufficient size to accommodate the penetrating item as well as additional required fill materials, such as sealants, firestopping and smoke sealants, insulation, and the like, without exceeding the maximum opening allowable by the manufacturer of the additional required fill material.
- .2 When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with firestopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

1.4 Concealed Services

- .1 Unless otherwise indicated, conceal pipes, ducts, and wiring in floors, walls, and ceilings in finished areas. Do not conceal until after:
 - .1 Review by *Consultant* and authority having jurisdiction.
 - .2 Recording actual locations on as-built drawings where locations differ from those shown on *Drawings*.
- .2 Provide incidental furring or other enclosures as required.
- .3 Notify *Consultant* in writing of interferences before installation.

1.5 Trademark and Labels

- .1 Trademarks and labels, including applied labels, shall not be visible in finished work in finished areas, unless otherwise accepted or indicated by *Consultant*, and except for trademarks and labels:
 - .1 That are essential to identify materials, systems, assemblies, and equipment for maintenance and replacement purposes.
 - .2 That are essential for life safety, fire resistance, and temperature rise ratings.

Execution

1.6 Interferences

- .1 Coordinate placement of equipment to ensure that components will be properly accommodated within spaces provided prior to commencement of the *Work*.
- .2 Take complete responsibility for remedial work that results from failure to coordinate aspects of work prior to its fabrication/installation.
- .3 Maintain accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment in layout of equipment and services, Notify *Consultant* if indicated clearances are in conflict.

1.7 Publicity Releases and Photographs

- .1 No press or publicity releases, including photographs of the *Place of the Work*, will be permitted without prior written approval of the *Owner*.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Manufacturer's Instructions

- .1 Install, erect, or apply *Products* in accordance with manufacturer's written requirements. Do not rely on labels or enclosures supplied with *Products*. Obtain written requirements directly from manufacturers.
- .2 Notify *Consultant*, in writing, of conflicts between *Contract Documents* and manufacturer's instructions where, in *Contractor's* opinion, conformance with *Contract Documents* instead of the manufacturer's instructions may be detrimental to the *Work* or may jeopardize the manufacturer's warranty.
- .3 Improper installation or erection of *Products*, due to failure in complying with these requirements, shall result in removal and re-installation of such *Products* as part of the *Work* at no additional cost to the *Owner*.
- .4 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.

3.2 Galvanic/Dissimilar Metal Corrosion

- .1 Insulate dissimilar metals from each other by suitable plastic strips, washers or sleeves to prevent galvanic corrosion where conductive liquid or electrolyte exists or may reasonably be expected to exist.

3.3 Workmanship

- .1 General:
 - .1 Execute the *Work* using workers experienced and skilled in the respective duties for which they are employed.
 - .2 Do not employ an unfit person or anyone unskilled in their required duties.

Execution

- .3 Remove *Products* or materials that have been broken, chipped, cracked, discoloured, abraded, or damaged during construction period and provide undamaged *Products* or materials meeting the requirements of the *Contract Documents*.
- .2 Coordination:
 - .1 Ensure cooperation of workers in layout of the *Work*. Maintain efficient and continuous supervision.
 - .2 Be responsible for coordination and placement of openings, sleeves and accessories.
- .3 Backer plates:
 - .1 Provide backer plates to support and provide anchorage base to carry loads from surface or recessed applied materials.
- .4 Cutting and remedial work:
 - .1 Perform cutting and remedial work required to make parts of the *Work* come together. Coordinate the *Work* to ensure this requirement is maintained. Comply with requirements of Section 01 73 29.
 - .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.
- .5 Location of fixtures:
 - .1 Locations of fixtures, access panels, outlets, and mechanical and electrical items indicated on *Drawings* are approximate only.
 - .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. Architectural drawings will relate these items to known dimensions, such as ceiling tile grid or wall locations and the like.
 - .3 Obtain *Consultant's* acceptance for precise locations of fixtures, access panels, outlets, mechanical, and electrical items.
 - .4 *Consultant* reserves the right to relocate electrical outlets and mechanical fixtures at a later date, but prior to installation, without cost, provided that the relocation per outlet does not exceed 3050 mm (10') from the original location.
 - .5 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.
- .6 Protection of work in progress:
 - .1 Provide protection required by authorities having jurisdiction.
 - .2 Protect parts of the *Work* completed or in progress from soiling, abrasion, punctures, damage, and defacement, and maintain protection until the surrounding or overhead work is complete.

Execution

- .3 Remove and replace materials damaged or defaced as a result of failure to provide adequate protection.
- .4 Do not cut, drill, or sleeve any load bearing structural member without written permission of *Consultant*. Comply with requirements of Section 01 73 29.
- .5 Do not load or permit to be loaded any part of the *Work* with a weight or force that will endanger the safety or integrity of the *Work*.
- .6 Protect finished flooring from damage. Take special measures when moving heavy loads or equipment on them.
- .7 Keep surfaces free of oils, grease or other materials that may damage or deface them or affect bond of applied *Products*.
- .8 Protect existing buildings, curbs, roads and lanes. If, during the *Work*, any buildings, curbs, roads or lanes are damaged, bear costs for repairs.
- .7 Protection of mechanical and electrical *Products* or materials:
 - .1 Wrap in protective plastic and seal mechanical and electrical items and equipment prior to and during shipment, storage at the *Place of the Work* and after installation.
 - .2 Remove protective coverings only to the extent required for installation of the items. Re-install protection immediately following installation.
 - .3 Remove protective coverings in stages, as work areas are completed, or when directed by *Consultant*.
- .8 Operational requirements:
 - .1 Operable *Products* shall be provided fully operational and ready for intended use.
 - .2 Adjust operating hardware and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts for smooth squeak-free function, in accordance with manufacturer's requirements.
- .9 Alterations:
 - .1 Restore new or existing work which is altered as a result of the *Work* and *Make Good*.
 - .2 Materials and workmanship shall match existing materials and workmanship. Exposed materials shall match and blend in with the appearance of the existing undamaged surfaces in all respects including colours, textures, layout, jointing, and material types so as to not vary in appearance when compared to adjacent materials from a viewing distance of 1830 mm (6').

3.4 General Construction Tolerances

- .1 Match existing tolerances in every respect unless otherwise specified.
- .2 Where tolerances are not defined elsewhere in the *Contract Documents* or building code, construct the *Work* to the following tolerances:
 - .1 Maximum variation from plumb in vertical lines, surfaces of columns, walls, and arrises:

Execution

- .1 6.4 mm (1/4") in 3 m (10 ft)
- .2 9.6 mm (3/8") in a storey height not to exceed 6 m (20 ft)
- .3 12.7 mm (1/2") in 12 m (40 ft) or more
- .2 Maximum variation from plumb for external corners, expansion joints, and other conspicuous lines:
 - .1 6.4 mm (1/4") in any storey or 6 m (20 ft)
 - .2 12.7 mm (1/2") in 12 m (40 ft) or more
- .3 Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
 - .1 6.4 mm (1/4") in any bay or 6 m (20 ft)
 - .2 12.7 mm (1/2") in 12 m (40 ft) or more
- .4 Maximum variation from drawing location of columns, walls, and partitions:
 - .1 12.7 mm (1/2") in any storey or 6 m (20 ft)
 - .2 19 mm (3/4") in 12 m (40 ft) or more.
- .5 Maximum variation in cross-sectional dimension of columns and thicknesses of wall from dimensions indicated:
 - .1 Minus 6 mm (1/4")
 - .2 Plus 12.7 mm (1/2")
- .6 Maximum variation from plane or from straight:
 - .1 3.2 mm (1/8") in 3 m (10 ft) under a 3 m (10 ft) straight edge.
- .7 Maximum variation from angle indicated:
 - .1 10 seconds.
- .8 Tolerances shall be non-cumulative.

END OF SECTION

Cutting and Patching

PART 1 - GENERAL

1.1 Request for Cutting, Patching and Remedial Work

.1 Submittal Items:

- .1 Comply with administrative requirements of Section 01 33 00.
- .2 Submit written request in advance of cutting, coring, and alteration that affects or is likely to affect:
 - .1 Structural integrity of any element of *Work*.
 - .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 *Owner* or work of other contractors.
 - .6 Warranty of *Products* affected.
- .3 Include in request:
 - .1 Identification of *Project*.
 - .2 Location and description of affected work, including drawings or sketches as required.
 - .3 Statement on necessity for cutting or alteration.
 - .4 Description of proposed work, and *Products* to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on *Owner* or work of other contractors.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be performed.
 - .9 Non-destructive structural survey: Location of reinforcement in concrete structure confirmed by non-destructive, positive method other than X-ray.
- .4 Do not commence cutting, patching, or remedial work until request has been reviewed by *Consultant*.

PART 2 - PRODUCTS

2.1 Materials

- .1 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.
- .2 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.

Cutting and Patching

PART 3 - EXECUTION

3.1 Preparation

- .1 Inspect existing conditions in accordance with Section 01 71 00, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of the *Work*.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to maintain structural integrity of surroundings. Provide devices and methods to protect other portions of the *Work* from damage.
- .5 Provide protection from elements for areas which may be exposed by uncovering work.
- .6 Where uncovering of area exposes local deterioration, cracking, evidence of water infiltration, structural settlement, previous modifications, or other unexpected conditions, advise *Consultant* immediately in writing and leave conditions exposed until receipt of *Consultant's* written instructions. If area is exposed to the exterior, provide temporary protection from inclement weather.

3.2 Existing Services and Utilities

- .1 Protect, relocate, or maintain existing active services or utilities except where breaking into or connecting to them. When inactive services are encountered, cap off in a manner approved by authority having jurisdiction and stake or otherwise record location of capped service. Record location of services, including depth, on as-built drawings.
- .2 When breaking into or connecting to existing active services or utilities, execute the *Work* at times approved by *Owner*, with a minimum of disturbance to *Owner's* ongoing operations, the *Work*, and traffic. Give notice to authorities having jurisdiction as required by such authorities.
- .3 Keep duration of interruptions to a minimum.
- .4 Carry out interruptions outside regular working hours of occupants unless *Owner's* prior written approval is obtained.
- .5 Construct or erect barriers in accordance with Section 01 50 00 as required to protect pedestrian and vehicular traffic.

3.3 Cutting and Patching

- .1 Coordinate and perform the *Work* so that cutting and patching work is kept to a minimum.
- .2 Execute cutting, fitting, and patching to complete the *Work*. Under no circumstances will overcutting of corners of opening be accepted. Ensure corners of openings to be cut are predrilled or sawed.
- .3 Remove and replace defective and non-conforming work.
- .4 Remove samples of installed work for testing if directed by *Consultant*.
- .5 Provide openings in non-structural elements of the *Work* for penetrations of mechanical and electrical work.

Cutting and Patching

- .6 Perform work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ qualified installer with at least 3 years of relevant experience to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 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*.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed to be used anywhere within existing buildings unless approved by *Consultant*.
- .10 Restore work with new *Products* in accordance with requirements of *Contract Documents*.
- .11 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and with suitable allowance for deflection, expansion, contraction, and firestopping.
- .12 Enclose pipes, ducts, conduit and wires passing through floors at areas where faucets occur in a 100 mm (4") high metal sleeve and make air and watertight with water resistant firestopping.
- .13 Completely seal voids of penetrations of fire rated wall, ceiling, and floor constructions with firestopping and smoke seals.
- .14 Execute cutting, patching, and remedial work in manner that does not jeopardize manufacturers' warranties.
- .15 Refinish surfaces to match adjacent finishes. Refinish continuous surfaces to nearest intersection. Refinish entire assembly units.

END OF SECTION

Cleaning and Waste Management

PART 1 - GENERAL

1.1 Section Includes

- .1 Waste management.
- .2 Storage, handling, and protection.
- .3 Coordination.
- .4 Cleaning.
- .5 Disposal of waste.

1.2 Waste Management

- .1 Comply with requirements of authorities having jurisdiction.
- .2 Remove waste material from the *Place of the Work* daily. If waste is collected in bins, bins to be removed from site once full.
- .3 Arrange and pay for removal of debris and waste from the *Place of the Work*.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Pay fees.

1.3 Storage, Handling and Protection

- .1 Store, materials to be reused, recycled and salvaged in locations to prevent contamination of materials being diverted from landfill.
- .2 Prevent contamination of materials to be salvaged and recycled, and handle such materials, in accordance with requirements for acceptance by designated facilities.

1.4 Coordination

- .1 Coordinate waste management and disposal procedures and requirements with other activities at the *Place of the Work* so that there is no delay in the *Work*, and at no increase in either the *Contract Time* or the *Contract Price*.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Cleaning

- .1 General cleaning requirements:
 - .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - .2 Store volatile wastes in covered metal containers, and remove from *Place of the Work* daily.
 - .3 Prevent accumulation of wastes which create hazardous conditions.

Cleaning and Waste Management

- .4 Provide adequate ventilation during use of volatile or noxious substances. Do not rely on building ventilation systems for this purpose.
- .5 Prevent cross-contamination during the cleaning process.
- .6 Notify the *Consultant* of the need for cleaning caused by *Owner* or other contractors.
- .2 Materials:
 - .1 Use only cleaning materials in accordance with written requirements of manufacturer of surface to be cleaned and in accordance with written requirements of cleaning material manufacturer.
- .3 Cleaning during construction/progressive cleaning:
 - .1 Clean-up the *Place of the Work* daily. Maintain clean and clear egress routes at all times.
 - .2 Maintain *Place of the Work*, grounds and public properties free from accumulations of waste materials and rubbish.
 - .3 Provide appropriate, clearly marked containers at the *Place of the Work* for collection of waste materials and rubbish. Remove waste materials and rubbish from the *Place of the Work* when containers become full.
 - .4 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.
 - .5 Vacuum and clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until *Substantial Performance of the Work*.
 - .6 Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces nor contaminate building systems.
 - .7 Promptly as the *Work* proceeds, on a daily basis and upon completion, clean up and remove rubbish, surplus materials and equipment.
 - .8 Remove as the work of this section progresses, corrosive and foreign materials which may set or become difficult to remove at time of final cleaning or which may damage members.
 - .9 Wash exposed surfaces with a cleaning solution approved by *Product* manufacturers.
 - .10 Debris and waste not permitted within cavities of *Work*.
- .4 Cleaning Prior to *Ready-for-Takeover*

Cleaning and Waste Management

- .1 Immediately prior to *Consultant's* review to determine if *Ready-for-Takeover* has been achieved, remove surplus *Products* and construction machinery and equipment not required for the performance of the remaining *Work* and clean in accordance with Final Cleaning paragraphs in Section 01 74 00 to the greatest extent practicable given work remaining to be completed. Cleaning shall be to a sufficient extent to permit the *Consultant's* review to be performed properly and reasonably.
- .5 Final cleaning:
 - .1 Before final cleaning, arrange a meeting at *Place of the Work* to determine the acceptable standard of cleaning. Ensure that *Owner, Consultant, and Contractor* are in attendance.
 - .2 Remove from *Place of the Work* surplus *Products*, waste materials, recyclables, *Temporary Work*, and *Construction Equipment* not required to perform any remaining work and other than that caused by the *Owner*, and leave the *Work* clean and suitable for occupancy by *Owner*.
 - .3 Remove waste material and debris from crawlspaces and other accessible concealed spaces.
 - .4 Clean and polish prefinished and finished surfaces including: glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or otherwise damaged glass.
 - .5 Clean exterior and interior window glass and frames.
 - .6 Remove stains, spots, marks and dirt from decorative parts of the *Work*, electrical and mechanical fixtures, furniture fittings, walls, and floors.
 - .7 Vacuum clean and remove dust from building interiors, exposed wall, floor, and ceiling surfaces, behind grilles, louvres, and screens, and above suspended ceiling tiles and panels. Vacuum clean interior of electrical equipment.
 - .8 Clean floor finishes in accordance with manufacturer's written requirements.
 - .9 Remove non-permanent labels.
 - .10 Remove dirt and residue from surfaces.
 - .11 Inspect finishes, fittings and equipment and ensure specified workmanship and operation.
 - .12 Remove protective coatings, clean surfaces and remove excess compounds and sealant materials. Make good defective, scratched or damaged work.
 - .13 Clean equipment and fixtures to a sanitary condition,
 - .14 Remove seal wrap and protective coverings from mechanical and electrical *Products* and materials and clean as required.
 - .15 Clean mechanical, electrical, and other equipment. Replace filters for mechanical equipment.

Cleaning and Waste Management

- .16 Clean and/or replace lighting reflectors, lamps, light fixtures, lenses, bulbs, and other lighting surfaces, and grilles.
- .17 Clean architectural concrete to remove surface discolouration, efflorescence, and the like. Use a suitable cleaning agent which will not stain the surfaces or mar the texture.
- .18 Use leaf blowers to clean landscaped surfaces.
- .19 Lock or otherwise restrict access to each room or area after completing final cleaning in that area.
- .20 Re-clean as necessary areas that have been accessed by *Contractor's* workers prior to *Owner* occupancy.

3.2 Disposal of Waste

- .1 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.
- .2 Handle waste materials not reused, salvaged or recycled in accordance with appropriate regulations and codes.
- .3 Do not bury rubbish and waste materials at the *Place of the Work*.
- .4 Do not dispose of waste or volatile materials into waterways or storm or sanitary sewers.
- .5 Do not burn waste materials at the *Place of the Work*.
- .6 Comply with waste disposal requirements of authorities having jurisdiction.
- .7 Deliver to nearest appropriate depot materials accepted for recycling by region or municipality having jurisdiction over the *Place of the Work*, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot scrap and excess gypsum wallboard for recycling of this material. Costs for this work are included in the *Contract Price*.
- .8 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Pay fees.

END OF SECTION

Closeout Procedures

PART 1 - GENERAL

1.1 Section Includes

- .1 General *Contract* closeout procedures.
- .2 *Substantial Performance of the Work*.
- .3 *Ready-for-Takeover*.
- .4 Inspection and review before *Ready-for-Takeover*
- .5 Partial user occupancy.
- .6 Final inspection for completion of the *Contract*.
- .7 Warranty period.

1.2 General *Contract* Closeout Procedures

- .1 The procedures for completing *Contract* and acceptance by the *Owner* shall be in accordance with the methods described in OAA/OGCA Document 100 (July 1, 2018, and reissued January 8, 2019) and any additional requirements described below.
- .2 Stages will be reviewed at the *Contract* start-up meeting to ensure that parties understand their responsibilities. Refer to Section 01 31 19 for procedures and requirements for *Contract* start-up meeting.
- .3 Within 4 weeks of commencement of the *Work*, submit to the *Consultant* a list of closeout submittals required by the *Contract Documents*.

1.3 *Substantial Performance of the Work*

- .1 The prerequisites to, and the procedures for, attaining *Substantial Performance of the Work*, or similar such milestone as provided for in the Construction Act, shall be:
 - .1 As described in Section 01 77 00.
 - .2 Independent of those for attaining *Ready-for-Takeover* of the *Work*.
 - .3 In accordance with the Construction Act.
- .2 Deficiency review:
 - .1 Neither *Owner* nor *Consultant* will be responsible for preparation or issuance of extensive lists of deficiencies. *Contractor* assumes prime responsibility for ensuring that items shown and described in the *Contract Documents* are complete. Any reviews to approve the certificate of *Substantial Performance of the Work* will be immediately cancelled if it becomes obvious to the *Consultant* that extensive deficiencies are outstanding.

Closeout Procedures

- .2 The *Contractor* shall conduct an inspection of the *Work* to identify deficiencies and defects, which shall be repaired. When the *Contractor* considers that the *Work* is substantially performed, the *Contractor* shall prepare and submit to the *Consultant* a comprehensive list of items to be completed or corrected (the deficiency list) and apply for a review of the *Work* by the *Consultant* to determine if *Substantial Performance of the Work* has been achieved.
- .3 The *Contractor's* request described above shall include a statement by *Contractor* that the *Work* to be reviewed by *Consultant* for deficiencies is, to the best of the *Contractor's* knowledge, in compliance with *Contract Documents*, reviewed *Shop Drawings*, and samples, and that deficiencies and defects previously noted by *Consultant* have been repaired.
- .4 No later than 10 *Working Days* after the receipt of the *Contractor's* request described above, but contingent upon the prior receipt, by the *Consultant*, of the closeout submittals in the manner and form specified in Section 01 78 00, the *Consultant* and the *Contractor* will review the *Work* to identify any defects or deficiencies. If necessary, the *Contractor* shall tabulate a list of deficiencies to be corrected prior to *Substantial Performance of the Work* being certified by the *Consultant*. During review, the *Consultant* and the *Contractor* will decide which deficiencies or defects must be rectified before *Substantial Performance of the Work* can be certified, and which defects are to be treated as warranty items.
- .5 Provide a schedule of planned deficiency review having regard to the foregoing.
- .3 Certification of *Substantial Performance of the Work*:
 - .1 When the *Consultant* considers that the deficiencies and defects have been completed and that it appears that the requirements of the *Contract Documents* have been substantially performed, the *Consultant* shall issue a certificate of *Substantial Performance of the Work* to the *Contractor*, stating the date of *Substantial Performance of the Work*.
 - .2 The certificate of *Substantial Performance of the Work* shall be prepared and issued in accordance with the Construction Act.
 - .1 Inform *Owner*, *Consultant*, *Subcontractors*, and *Suppliers* which publication is to be used for publishing certificate of substantial performance in accordance with Section 01 31 19.

1.4 Ready-for-Takeover

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

1.5 Inspection and Review Before Ready-for-Takeover

- .1 *Contractor's* Inspection: Before applying for the *Consultant's* review to establish *Ready-for-Takeover* of the *Work*:
 - .1 Ensure that the specified prerequisites to *Ready-for-Takeover* of the *Work* are completed.

Closeout Procedures

- .2 Conduct an inspection of the *Work* to identify defective, deficient, or incomplete work.
- .3 Prepare a comprehensive and detailed list of items to be completed or corrected.
- .4 Provide an anticipated schedule and costs for items to be completed or corrected.
- .2 *Consultant's Review*: Upon receipt of the *Contractor's* application for review, together with the *Contractor's* list of items to be completed or corrected, the *Consultant* and the *Contractor* shall arrange a mutually satisfactory agreed date and time to jointly review the *Work*. The *Consultant* will advise the *Contractor* whether or not the *Work* is *Ready-for-Takeover*. Add additional items, if any, to the *Contractor's* list of items to be completed or corrected. Provide the *Consultant* with a copy of the revised list.
- .3 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work. The *Contractor's* inspection and *Consultant's* review procedures specified above shall be repeated until the *Work* is *Ready-for-Takeover* and no items remain on the *Contractor's* list of items to be completed or corrected.
- .4 When the *Consultant* determines that the *Work* is *Ready-for-Takeover*, the *Consultant* will notify the *Contractor* and the *Owner* in writing to that effect.

1.6 Partial User Occupancy

- .1 If partial *Owner* occupancy of a part of the *Work* is required before the date of *Ready-for-Takeover* of the entire *Work* of the *Contract*, the provisions of this Section shall apply, to the extent applicable, to that part of the *Work* that the *Owner* intends to occupy.

1.7 Final Inspection for Completion of the *Contract*

- .1 Deficiencies and defects shall be made good before the *Contractor* submits a written request for final review of the *Work* and before the *Contract* is considered complete.
- .2 When *Contractor* is satisfied that the *Work* is complete, and after the *Contractor* has reviewed the *Work* to verify its completion in accordance with the requirements of the *Contract Documents*, the *Contractor* shall submit a written request for a final review by the *Consultant*, who in turn will notify the *Owner*.
- .3 If there are any deficiencies identified as a result of this review, they shall be listed by the *Consultant* and submitted to the *Contractor*. This list shall be recognized as the final deficiency list for purposes of acceptance of the *Work* under the *Contract*.
- .4 Such deficiencies shall be corrected by a date mutually agreed upon between *Consultant* and the *Contractor*, unless a specific date is required by *Contract*, and a further review by the *Consultant* shall be called for by the *Contractor* following his own review to take place within 7 days from date of request.
- .5 *Contractor* shall thereafter submit invoice for final payment.
- .6 Money withheld for deficiency work shall be released only when all deficiencies have been completed. No partial payment to be recognized until all work is completed.

Closeout Procedures

1.8 Warranty Period

- .1 Provide on-going review and attendance to building call-back, maintenance and repair problems during the warranty periods.
- .2 At the beginning of the 12th month after *Ready-for-Takeover*, the *Owner*, *Contractor* and *Consultant*, along with key *Subcontractors* as designated, shall carry out a complete review of building and its systems to determine which deficiencies are to be rectified under the warranty. *Contractor* shall be responsible for timely written notification of *Owner*, and *Consultant* prior to such end of warranty period inspection and any delay in such notification shall extend such warranty period until proper notification is received by *Owner*, and *Consultant*.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Closeout Submittals

PART 1 - GENERAL

1.1 Section Includes

- .1 As-built documents.
- .2 Record drawings.
- .3 Operation and maintenance manuals.
- .4 Operation and maintenance book.
- .5 *Project* data book.
- .6 Shop drawing book.
- .7 Warranty book.
- .8 Posted operating instructions.
- .9 Spare parts, maintenance materials, and special tools.

1.2 Administrative Requirements

- .1 Collect reviewed submittals, and assemble required closeout submittals executed by *Subcontractors*, *Suppliers*, and manufacturers. Prior to submitting closeout submittals to the *Consultant*:
 - .1 Review maintenance manual contents (operating, maintenance instructions, as-built drawings, materials) for completeness.
 - .2 Review supply and completeness of spare parts required by *Contract Documents* and manufacturers.
 - .3 Review in relation to *Contract Price*, *Change Orders*, *Change Directives*, holdbacks and other adjustments to the *Contract Price*.
 - .4 Review inspection and testing reports to verify conformance to intent of *Contract Documents* and that changes, repairs or replacements have been completed.
 - .5 Execute transition of performance bond and labour and materials payment bond to warranty period requirements.
 - .6 Submit a final statement of accounting giving total adjusted *Contract Price*, previous payments, and monies remaining at time of application for completion of the *Contract*. *Consultant* will issue a final change order reflecting approved adjustments to *Contract Price* not previously made.
- .2 No later than 10 *Working Days* prior to submitting request for *Consultant's* review to determine if *Substantial Performance of the Work* has been achieved, submit to the *Consultant* the closeout submittals specified in this section and elsewhere in the *Contract Documents*.
- .3 For equipment put into use with *Owner's* permission during the *Work*, submit required closeout submittals within 10 *Working Days* after start-up.

Closeout Submittals

- .4 For items of the *Work* delayed materially beyond date of *Substantial Performance of the Work* provide updated closeout submittals within 10 *Working Days* after acceptance, listing date of acceptance as start of warranty period.
- .5 Neither the *Consultant's* review to determine if *Substantial Performance of the Work* has been achieved, nor acceptance of the *Work*, will take place until receipt, by the *Consultant*, of acceptable copies of the closeout submittals required herein and by the *Contract Documents*.

1.3 As-Built Documents

- .1 Submit 1 copy of as-built documents in hard copy in the form specified in Section 01 32 00.
- .2 In addition, submit "CAD" files and digital printed "PDF" copy of as-built documents. Submit on a USB drive and title "As-Built drawings and O&M manual."

1.4 Operation and Maintenance Manuals

- .1 Prepare a comprehensive operation and maintenance manual, in the language of the *Contract*, using personnel qualified and experienced for this task.
- .2 Submit an initial draft of the operation and maintenance manual for *Consultant's* review. If required by *Consultant's* review comments, revise manual contents and resubmit for *Consultant's* review. If required, repeat this process until *Consultant* accepts the draft manual in writing.
- .3 Submit operation and maintenance manuals as follows:
 - .1 Submit 2 digital copies ("PDF" files) of operation and maintenance manuals. Submit on a USB drive and title "As-Built drawings and O&M manual."

1.5 Operation and Maintenance Manual Format

- .1 Organize operation and maintenance manuals into the following general components:
 - .1 Operation and maintenance book.
 - .2 *Project* data book.
 - .3 Shop drawing book.
 - .4 Warranty book.
- .2 Organize data in the form of an instructional manual.
- .3 Bind each general component of the operation and maintenance books in separate vinyl hard covered, 3 ring loose leaf binders.
- .4 Enclose title sheet, labelled as applicable, with project name, date and list of contents.
- .5 Organize contents into applicable sections of work to parallel project *Specifications* breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .6 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

Closeout Submittals

- .7 Cover: Identify each binder with typed or printed title "Operation and Maintenance Manual", name of *Project* or facility, and subject matter of contents.
- .8 Text: Manufacturer's printed data, or typewritten data.

1.6 Operation and Maintenance Book

- .1 Operation and maintenance books shall contain operating and maintenance data and information specified below for supplied *Products*.
- .2 Neatly type lists and notes. Use clear drawings, diagrams of manufacturers' literature.
- .3 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.
- .4 Panel Board Circuit Directories: provide electrical service characteristics, controls, and communications.
- .5 Include installed colour coded wiring diagrams.
- .6 Description, operation and maintenance instructions for equipment and parts list. Indicate nameplate information such as make, size, capacity, serial number.
- .7 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.
- .8 Maintenance Requirements: include routine procedures and guide for trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .9 Provide servicing and lubrication schedule, and list of lubricants required.
- .10 Include manufacturer's printed operation and maintenance instructions.
- .11 Include sequence of operation by controls manufacturer.
- .12 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .13 Provide installed control diagrams by controls manufacturer.
- .14 Provide *Contractor's* coordination drawings, with installed colour coded piping diagrams.
- .15 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .16 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .17 Include testing and balancing reports.
- .18 Include additional content as specified in technical *Specifications* sections.

Closeout Submittals

1.7 Project Data Book

- .1 *Project Data Book* shall include the following information supplemented by additional required data specified elsewhere in the *Contract Documents*:
 - .1 Maintenance instructions for finished surfaces and materials.
 - .2 Copy of hardware and paint schedules.
 - .3 Names, addresses and phone numbers of *Subcontractors* and *Suppliers*, as applicable.
 - .4 Additional material used in the *Work* listed under various sections showing name of manufacturer and source of supply.
 - .5 Report recording demonstration and instruction provided to *Owner* for operation and maintenance of building systems as described in Section 01 79 00.
 - .6 Key construction photos.
 - .7 Permits and forms:
 - .1 Certificate of Clearance from the Workplace Safety and Insurance Board (WSIB).
 - .2 Electrical authority certificate of inspection.
 - .8 *Integrated fire protection and life safety systems tests* final test report prepared in accordance with Section 01 91 26.
 - .9 Waste management and disposal reports, prepared in accordance with Section 01 74 00.

1.8 Shop Drawing Book

- .1 Submit one copy of each final accepted *Shop Drawings* issued for the *Work* on which have been recorded changes made during fabrication and installation caused by unforeseen conditions.
- .2 Engineered *Shop Drawings* shall include copies of the certificate of insurance, the engineer's field review reports, and the engineer's letters of general conformity that were provided as part of the engineered submittal in accordance with Section 01 33 00 appended to the pertinent engineered *Shop Drawings* in the shop drawing manual.

1.9 Warranty Book

- .1 Submit copies of bonds, guarantees, warranties and extended warranties together, complete with an indexed summary list of warranties and expiration dates. Warranties to be in accordance with Section 01 78 36.
- .2 Separate each warranty with index tab sheets keyed to Table of Contents listing.
- .3 List each warrantor with complete contact information.
- .4 Verify that documents are in proper form and contain full information. Warranties shall be for the correct duration and shall be in *Owner's* name.
- .5 Include maintenance bond(s).

Closeout Submittals

1.10 Posted Operating Instructions

- .1 Prepare operating instructions in English for posting near equipment and systems. Posted instructions to be glass covered, framed and mounted.
- .2 Posted instructions to consist of simplified, consolidated equipment, control and power diagrams graphically representing the entire system, including concise instructions on how to start and stop systems, what settings and conditions are to be observed by the operators, and what control adjustments are to be made or maintained by the operator.
- .3 Posted instructions shall include control diagrams with added specific operating instructions, controls, interlocks, and the like.
- .4 Posted instructions shall include:
 - .1 HVAC controls for each system.
 - .2 One line schematic diagrams of water supply.
 - .3 One line isometric diagrams of sanitary drainage.
 - .4 One line diagrams of steam distribution, hot and cold water systems, including risers, valves, control devices, etc.

1.11 Spare Parts, Maintenance Materials, and Special Tools

- .1 Provide overage, extra stock, and maintenance materials, including keys, in quantities specified in the *Contract Documents*.
- .2 Submit to *Consultant* a typed inventory list of maintenance materials prior to application for *Substantial Performance of the Work*. List all items, complete with quantities, and storage locations. Include *Consultant* reviewed inventory listing in final submission to *Owner*.
- .3 Prepare and submit a master list identifying maintenance materials and maintain a log of when materials are turned over to *Owner* and signing authority for acceptance of materials on behalf of *Owner*.
- .4 Provide tags for special tools identifying their function and associated *Product*.
- .5 Supply spare parts, maintenance materials, and special tools in quantities specified in technical *Specifications* sections.
- .6 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*.
 - .1 Replace incorrect or damaged maintenance materials.
- .7 Deliver to and store items at location and time directed by *Owner*. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.
 - .1 Clearly mark cartons or packaging as to contents, project name, and *Supplier*.
 - .2 If applicable give colour and finish, room number or area where material is used.
 - .3 Include necessary information for re-ordering of materials as part of packaging of materials.

Closeout Submittals

- .8 Catalogue all items and submit to *Consultant* an inventory listing organized by *Specifications* section. Include *Consultant* reviewed inventory listing in operation and maintenance manual.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Warranties

PART 1 - GENERAL

1.1 Warranties

- .1 Warranties shall be in accordance with GC 12.3, as amended.

1.2 Extended Warranties

- .1 Extended warranties shall be in accordance with GC 12.3, as amended, and as follows:
 - .1 Where specifically identified in the *Contract Documents*, extended warranties shall be furnished by individual manufacturer for particular product/system/assembly.
 - .2 Extended warranties shall include for proper performance of the portion of the *Work* as defined by the scope of the applicable *Specifications* section to the extent that the design and *Contract Documents* permit such performance.
 - .3 The *Owner* shall promptly give the warrantor notice in writing of observed defects and deficiencies which occur during the warranty period.
 - .4 Extended warranties specified shall be in addition to, and run concurrent with, other warranties required by the *Contract Documents*. Manufacturer's disclaimers and limitations on product warranty do not relieve *Contractor* of obligations under requirements of the *Contract Documents*.
 - .5 Submit extended warranty on warrantor's standard form specifically endorsed by the warrantor to the *Owner* and shall include the following information:
 - .1 Name and address of *Project*.
 - .2 Warranty commencement date.
 - .3 Warranty period.
 - .4 Specific warranty terms as required in applicable portion of *Contract Documents*.
 - .5 Name and title of authorized signing officer and seal of warrantor.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Demonstration and Training

PART 1 - GENERAL

1.1 Section Includes

- .1 Systems demonstration and training.

1.2 Preparation

- .1 Prior to scheduling demonstration and training:
 - .1 Review condition of equipment or systems for which demonstration and training is required and that have been used in the course of the *Work* to ensure turning over at completion in "as new condition", with warranties dated and certified from time specified.
 - .2 When partial occupancy of uncompleted project is required by *Owner*, coordinate *Owner's* uses, requirements, access, and the like, with requirements to complete the *Work*.

1.3 Submittals

- .1 Submit proposed dates, times, durations, and locations for demonstration and training of each item of equipment and each system for which demonstration and training is required. Allow sufficient time for training and demonstration for each item of equipment or system, or time as may be specified in technical *Specifications*.
 - .1 Correlate with construction schedule in accordance with Section 01 32 00.
- .2 *Consultant* and *Owner* will review submittal and advise *Contractor* of any necessary revisions.
- .3 Submit report(s) within 5 *Working Days* after completion of demonstration and training:
 - .1 Identifying time and date of each demonstration and training session.
 - .2 Summarizing the demonstration and training performed.
 - .3 Including a list of attendees.

1.4 Demonstration and Training

- .1 Perform system demonstration work no later than 15 *Working Days* prior to submitting request for *Consultant's* review to determine if *Substantial Performance of the Work* has been achieved.
 - .1 Provide *Owner* with 5 *Working Days* prior written notice of dates scheduled for demonstration and training.
- .2 Submit required certificates of approval or acceptance from authorities having jurisdiction.
- .3 Prerequisites to demonstration and training:
 - .1 Testing, adjusting, and balancing has been performed in accordance with *Contract Documents*.
 - .2 Equipment and systems are fully operational.

Demonstration and Training

- .3 Copy of completed operation and maintenance manual is available for use in demonstration and training.
- .4 Conditions for demonstration and training comply with requirements specified in technical *Specifications*.
- .4 Demonstration and training:
 - .1 Demonstrate and provide training to *Owner's* personnel.
 - .2 Instruct *Owner's* personnel in operation and maintenance of equipment and systems, using operation and maintenance data provided as the basis for instructions. Arrange and coordinate instruction of *Owner's* staff in care, maintenance, and operation of building systems and finishes
 - .3 *Contractor*, manufacturer's representatives, and responsible personnel from *Subcontractors* whose work is being demonstrated shall be present at these demonstrations, as well as *Owner's* personnel.
 - .4 *Owner* shall provide list of personnel to receive training and shall coordinate their attendance at agreed upon times.
 - .5 Demonstration shall include start up, operation, control, adjustment, troubleshooting, servicing, and maintenance of each item of equipment and system.
 - .6 Review operation and maintenance manual in detail to explain all aspects of operation and maintenance.
 - .7 Instruct *Owner's* representative on use of software required for operation and maintenance of building systems and provide a toll-free telephone number or website address for further assistance to the *Owner*.
 - .8 Prepare and insert additional data in the operation and maintenance data manuals when the need for additional data becomes apparent during demonstration or instruction.
- .5 Correct deficiencies and defects identified during demonstration, instruction, or commissioning.
- .6 Attend 'end-of-work' testing and break-in or start-up demonstration.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

Integrated Fire Protection and Life Safety Systems Testing

PART 1 - GENERAL

1.1 Section Includes

- .1 Procedures for verifying and documenting that interconnections between systems provided for *integrated fire protection and life safety systems* functions are installed and operating in conformance with their *design criteria* and in accordance with CAN/ULC-S1001.
- .2 This specification is limited to testing of the interconnections between life safety and fire protection systems. Refer to separate technical specification sections for the individual testing and commissioning requirements for those systems.

1.2 Administrative Requirements

- .1 Definitions:
 - .1 Terms presented here in italic font are defined either in the Definitions of CCDC 2 – 2020, or in CAN/ULC-S1001.
 - .2 The *Consultant* shall be considered the *design professional* for the purposes of the *Contract*.
- .2 Coordination:
 - .1 Coordinate the applicable *Subcontractors* whose equipment or systems are part of the *integrated fire protection and life safety systems test*.
- .3 Conduct a pre-installation meeting in accordance with Section 01 31 19 and as follows:
 - .1 Attendees at pre-installation meeting shall include *Subcontractors* whose equipment or systems are part of the *integrated fire protection and life safety systems test*.
 - .2 Review requirements of authorities having jurisdiction, as well as requirements of, and roles and responsibilities for, each participant in the development of the *integrated test plan* and the execution of the *integrated fire protection and life safety systems test*.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Integrated test plan*:
 - .1 Develop the *integrated test plan* in accordance with Section 5 of CAN/ULC-S1001.
 - .2 Submit the *integrated test plan* for review by the *Consultant* at least 30 days prior to commencement of the first *integrated fire protection and life safety systems test*. The *integrated testing plan* shall comply with the requirements of CAN/ULC-S1001 and as specified herein.
 - .3 Distribute final copy of plan digitally as follows:
 - .1 Authorities having jurisdiction.

Integrated Fire Protection and Life Safety Systems Testing

- .2 One copy to be maintained at the *Place of the Work*.
 - .3 *Owner*.
 - .4 *Consultant*.
 - .5 *Contractor*.
 - .6 Consulting engineers, as applicable.
- .3 Final test report:
- .1 Upon successful completion of the *integrated fire protection and life safety systems tests*, submit a final test report in accordance with Section 7 of CAN/ULC-S1001.
 - .2 Distribute reports digitally as follows:
 - .1 Authorities having jurisdiction.
 - .2 One copy to be maintained at the *Place of the Work*.
 - .3 *Owner*.
 - .4 *Consultant*.
 - .5 *Contractor*.
 - .6 Consulting engineers, as applicable.

1.4 Quality Assurance

- .1 *Integrated testing coordinator* qualifications:
 - .1 The *integrated testing coordinator* services shall be provided by a firm or individual certified under the CAN/ULC-S1001 Certification of Integrated Testing Service Providers program.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Integrated Systems Testing Requirements

- .1 Conduct *integrated fire protection and life safety systems* testing in accordance with Section 6 of CAN/ULC-S1001 and the accepted *integrated testing plan*.

3.2 Demonstration and Training

- .1 Conduct demonstration and training in accordance with Section 01 79 00.
 - .1 Demonstrate the operation of, and providing training on, the integration of *fire protection and life safety systems*.
 - .2 Demonstration and training to include:
 - .1 The function of the integration.
 - .2 The method of integration: hardwired, network communication, operating protocols.

Integrated Fire Protection and Life Safety Systems Testing

- .3 The type of information: data, commands, monitoring.
- .4 Any temporary measures to be taken to retest in the future.

END OF SECTION

Demolition

PART 1- GENERAL

1.1 Summary

.1 Section includes:

- .1 Demolition and removal of existing building or structure.
- .2 Demolition and removal of selected non-structural portions of building.
- .3 Demolition and removal of site elements or selected portions thereof.
- .4 Salvage:
 - .1 Salvaging of designated items for reuse by *Owner*.
 - .2 Salvage of designated items to be reused or recycled.
- .5 Removal of surplus materials from the *Place of the Work*.
- .6 Related mechanical and electrical work and demolition requirements are covered under Divisions 21, 22, and 23 and Divisions 26, 27, and 28 respectively.

.2 Section excludes:

- .1 Demolition, removal, remediation, or abatement of designated substances or materials and toxic and hazardous substances.

1.2 Administrative Requirements

.1 Pre-demolition meeting:

- .1 Schedule a pre-demolition meeting following the procedures specified for pre-installation meetings in accordance with Section 01 31 19.
- .2 Review existing conditions at the *Place of the Work* thoroughly to establish full extent of items to be removed and items to remain. Commencement of demolition work will be considered to be acceptance of existing conditions at the *Place of the Work* and removal of such items.
- .3 Examine adjacent properties to determine extent of protection required.

1.3 Submittals

.1 Submit required submittals in accordance with Section 01 33 00.

.2 Demolition report:

- .1 Prior to commencement of the work of this section at the *Place of the Work*, prepare and submit to the municipal building department having jurisdiction over the *Place of the Work* a report on the proposed demolition methods and procedures for the removal of indicated structures for the safe retention of structures to remain.
- .2 Prepare report under the supervision, and bear the seal and signature, of a professional engineer licensed to practice engineering in the *Place of the Work*, experienced in this type of engineering, and in accordance with Section 01 33 00.

Demolition

- .3 Submit a PDF of the demolition report to the *Consultant* for record purposes only: *Consultant* shall neither review nor accept any liability for the contents of the report.
- .4 Without limiting the requirements of authorities having jurisdiction, the demolition report shall include:
 - .1 Drawings, diagrams and details showing sequence of demolition work and supporting structures.
 - .2 Description, in detail, of the methods and procedures for working at the base of existing buildings to remain.
 - .3 Schedule of demolition activities indicating the following:
 - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - .2 Interruption of utility services.
 - .3 Coordination for shutoff, capping, and continuation of utility services.
 - .4 Location of temporary street barricades, building interior partitions and means of egress.
 - .4 Written description of methods for removal and temporary bracing of structural members or supporting construction.
- .3 Obtain the demolition permit such that the engineer responsible for the preparation of the demolition report becomes the Engineer of Record for the demolition work. Prepare and submit reports, drawings, and other documents required as part of the municipal permit process prior to, during, and upon completion of the demolition work. Copies of the permit with the name of the Engineer of Record shall be submitted to the *Consultant* prior to the commencement of demolition.
 - .1 If an application has been made, by or on behalf of the *Owner*, to the building department having jurisdiction at the *Place of the Work*, it is a requirement of this *Contract* that the *Contractor* obtain an amendment to this application/permit such that the engineer responsible for the preparation of the demolition report specified in Section 02 41 16 becomes the Engineer of Record for the demolition work.
- .4 Special procedures submittals:
 - .1 Existing conditions documentation:
 - .1 Document existing conditions of adjoining construction and site improvements, including pre-existing damage to finish surfaces that might be misconstrued as damage caused by demolition operations.
 - .2 Comply with Section 01 32 33.
 - .3 Submit existing conditions documentation before demolition work begins.
 - .2 Inventory of items to be salvaged:
 - .1 Prepare typed inventory of units to be salvaged and cross-reference to drawing showing existing elevations.

Demolition

- .2 Inventory shall designate size of units, face setting bed, or natural setting bed. Provide temporary marking to salvaged units correlated to this inventory.
- .3 Submit inventory following procedures for submittal of shop drawings in accordance with Section 01 33 00.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor.*
 - .1 Shall have 5 years' specialized demolition experience, minimum.
 - .2 Shall be able to deploy adequate equipment and skilled personnel to complete work expediently in an efficient and orderly manner.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that utilities have been disconnected and capped.
- .2 Observe existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- .4 When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to *Consultant*.
- .5 Survey of existing conditions: Record existing conditions by use of photographs in accordance with Section 01 32 33.

3.2 Utility Services and Mechanical / Electrical Systems

- .1 Refer to Divisions 21, 22, and 23 and Divisions 26, 27, and 28 respectively.

3.3 Selective Demolition, General

- .1 Demolish and remove existing construction only to the extent required by new construction, and as otherwise indicated. Use methods required to complete the work within limitations of governing regulations and as follows:
 - .1 Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

Demolition

- .2 Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
- .3 Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
- .4 Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
- .5 Maintain adequate ventilation when using cutting torches.
- .6 Remove decayed, infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- .7 Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- .8 Dispose of demolished items and materials promptly.
- .2 Dispose of demolished materials from *Project* site except where noted otherwise and in accordance with authorities having jurisdiction. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- .3 Do not sell demolished material at the *Place of the Work*.
- .4 Clean existing surfaces specified to receive new applied finishes to assure proper adherence.

3.4 Selective Demolition Procedures for Specific Materials

- .1 Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- .2 Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- .3 Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- .4 Roofing: Remove existing roofing in a manner so that building interior remains watertight and weathertight.
 - .1 Refer to Division 7 for new roofing requirements.
 - .2 Remove existing roof membrane, flashings, copings, and roof accessories.
 - .3 Remove existing roofing system down to substrate.

Demolition

3.5 Building and Structural Demolition

- .1 Engineer of Record to observe condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.
- .2 Engineer of Record to observe progress of the demolition work to detect hazards that may result from building demolition activities.
- .3 Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- .4 Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - .1 Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.
- .5 Explosives: Use of explosives is not permitted.
- .6 Below-grade construction:
 - .1 Remove below-grade construction, including basements, foundation walls, slabs, and footings:
 - .1 Completely.
- .7 Demolition to be coordinated with and performed where required for new work as shown in the *Contract Documents* and as outlined in related documents without exception.
- .8 Record the progress of demolition work with progress photographs in accordance with Section 01 32 33.
- .9 Execute work in accordance with requirements of authorities having jurisdiction.
- .10 Remove demolition waste from *Place of the Work* and dispose.
- .11 Control dust and dirt produced during demolition in accordance with requirements of authorities having jurisdiction and Section 01 35 13 and Section 01 50 00.
- .12 Provide additional materials, labour and services required, not specifically specified or indicated, but necessary for proper completion of work.
- .13 Confine operations and workers to those parts of the building that are defined in the *Contract Documents*, and do not damage existing building beyond that necessary for the carrying out of the *Work*, and make good any such damage in every respect.
- .14 Do not disturb adjacent items designated to remain in place.

3.6 Sitework Demolition

- .1 Coordinate demolition with and perform where required for new work as shown in the *Contract Documents* and as outlined in related documents without exception.
- .2 Demolish work in accordance with requirements of authorities having jurisdiction.
- .3 Remove demolition waste from *Place of the Work* and dispose.

Demolition

- .4 Maintain the *Place of the Work* in a safe condition and erect safety barriers and lights as required. Ensure that no parts of existing structure are in danger of collapsing.
- .5 Control dust and dirt produced during demolition in accordance with requirements of authorities having jurisdiction and Section 01 50 00.
- .6 Provide additional materials, labour and services required, not specifically specified or indicated, but necessary for proper completion of work.
- .7 Dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .8 Confine operations and workers to those parts of the *Place of the Work* that are defined in the *Contract Documents*, and do not damage existing buildings or areas of the *Place of the Work* beyond that necessary for the carrying out of the *Work*, and make good any such damage in every respect.
- .9 Do not disturb adjacent items designated to remain in place.
- .10 In removal of structures, excavate to such extent to ensure safe demolition and removal of structure.
- .11 Excavate at least 300 mm (12") below pipe invert, when removing pipes under existing or future pavement area.
- .12 Remove designated trees or as many trees as required during demolition.
 - .1 Obtain written approval of *Consultant* prior to removal of trees not designated.
- .13 Demolition and removal of asphalt pavement:
 - .1 Remove existing asphalt pavement to lines and grades as indicated and as directed by *Consultant*.
 - .2 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.
 - .3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.
 - .4 Dispose of removed asphalt pavement by stock-piling in locations designated by Engineer.
 - .5 Removed asphalt pavement to be recycled in hot mix asphalt concrete under this contract may be stockpiled at designated asphalt plant site.
 - .6 Square up adjacent surfaces to remain in place by saw cutting or other method approved by the *Consultant*.
- .14 Finishing and restoration:
 - .1 Backfill and compact trenches, holes, pits, and low areas resulting from demolition work.
 - .1 Backfilling and compaction shall be in accordance with Section 31 23 00.

Demolition

- .2 Finished surfaces adjacent to roadways, parking lots, and pedestrian pathways, where asphalt or concrete pavement has been removed, shall be to within ± 10 mm (3/8") of grade specified or surrounding existing grade but not uniformly high or low.
- .3 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of the *Work*.
- .4 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.7 Salvage

- .1 Remove and store items indicated or directed for salvage. Remove, handle and transport such items to storage area designated in the *Contract Documents*, to an area within the *Place of the Work* designated by *Consultant*, or to an area away from the *Place of the Work* as directed by the *Consultant*. Perform such work to prevent damage to the items during removal and in storage.
- .2 The *Owner* shall review *Place of the Work* prior to commencement of demolition and instruct the *Contractor* of the items to be retained for re-use or be turned over to the *Owner*.
- .3 Remove and store indicated items for future use by *Owner*. Remove, handle and transport such items to storage area indicated in the *Contract Documents* or to an area within the *Place of the Work* designated by *Consultant*. Perform such work carefully and with diligence to prevent any damage to the items during removal and in storage.

3.8 Protection

- .1 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades and parts of existing building to remain. Make good damage caused by demolition.
- .2 Take precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify demolition engineer, *Contractor* and *Consultant*.
- .3 *Provide* temporary weather enclosures in accordance with Section 01 35 13 and Section 01 50 00.
- .4 Prevent debris from obstructing active services and drainage systems.
- .5 Protect work to remain against damage. Repair or replace damaged work at no additional cost to the *Owner*.
- .6 Slopes of excavated areas after removal of footings shall be left in a stable condition and as required by authorities having jurisdiction.

END OF SECTION

Concrete Formwork

PART 1 - GENERAL

1.1 General Requirements

- .1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.
- .2 Quantities and dimensions enclosed in brackets apply to Project for which Drawings are in imperial units.
- .3 Obtain a copy of CSA Standard A23.1, and maintain on site.

1.2 Description

- .1 Related Work Specified in Other Sections:
 - .1 Submittals and Shop Drawings Section 01 30 00
 - .2 Quality Control Section 01 40 00
 - .3 Excavation and Backfill Section 31 23 10
 - .4 Concrete Accessories Section 03 15 00
 - .5 Concrete Reinforcement Section 03 20 00
 - .6 Cast-In-Place Concrete Section 03 30 00
 - .7 Concrete Floor Finishes Section 03 35 00
 - .8 Grout Section 03 37 00
 - .9 Supply of Anchor Bolts, Plates and Accessories for Structural Steel Work (to be Built into Forms) Section 05 12 00
 - .10 Preparing Concrete Surfaces to Receive Dampproofing and Waterproofing Section 07 12 00
 - .11 Mechanical Items (to be Built into Forms) Division 21, 22 & 23
 - .12 Electrical Items (to be Built into Forms) Division 26, 27 & 28
- .2 Work Installed but Supplied under Other Sections
 - .1 Install materials specified to be supplied under other Sections of these project specifications. Materials include but are not limited to:
 - .1 Fabricated components, anchors, ties, anchor bolts, cast-in miscellaneous items, expansion joint components, subframes, bearing plates, sleeves and other inserts to be built into forms.

Concrete Formwork

- .2 Waterproof expansion joints for parking decks.
 - .3 Non-waterproof expansion joints for parking decks.
- .2 Ensure installation is to satisfaction of trades concerned and of Consultant prior to placing concrete.
- .3 Co-operation with Work of Other Sections:
 - .1 Check project Drawings and Specifications for requirements of other Sections, which will affect installation of Work of this Section.
- .4 Co-operation with Consultant:
 - .1 Before commencing Work, review with Consultant, Work performed under this Section.
 - .2 Schedule Work to allow sufficient time and access for Consultant to carry out periodic field review.
- .5 Cooperation with Inspection and Testing Company:
 - .1 Provide free access to Work.
- .6 Architectural Concrete:
 - .1 Architectural concrete shall mean concrete surfaces designated as “architectural concrete” in Contract Documents. Sandblasted and bush-hammered surfaces shall be considered as architectural concrete.

1.3 Quality Assurance

- .1 Reference Standards & Publications:
 - .1 All standards to be latest issue at time of tender.
 - .2 Provide one copy on site of the first three standards listed below.
 - .3 The following reference standards shall govern Work of this Section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following Standards apply but are not necessarily repeated in following list:
 - .1 2012 OBC, “Ontario Building Code”.
 - .2 CSA-A23.1-19, “Concrete Materials and Methods of Concrete Construction”.
 - .3 CSA-A23.3-19, “Design of Concrete Structures for Buildings”.

Concrete Formwork

- .4 ACI 117-10, Standard Specifications for Tolerances for Concrete Construction and Materials, American Concrete Institute.
 - .5 ACI 350-20, "Code Requirements for Environmental Engineering Concrete Structures".
 - .6 CSA-O86.14 (R2019), "Engineering Design in Wood (Limit States Design)".
 - .7 CSA-O121-17 (R2022), "Douglas Fir Plywood".
 - .8 CSA-O151-17 (R2022), "Canadian Softwood Plywood".
 - .9 CSA-S269.1-16 (R2021), "Falsework and Formwork".
 - .10 CAN/CSA-S269.2-16 (R2021), "Access Scaffolding for Construction Purposes".
 - .11 American Society for Testing and Materials (ASTM) where noted.
 - .12 Provincial safety standards where applicable.
 - .13 Conform to applicable safety regulations for erection, maintenance and removal of formwork.
- .2 Qualifications:
- .1 Formwork design engineer shall be insured against professional liability in accordance with section 74 subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection (2) is not acceptable.
- .3 Design of Formwork:
- .1 Assume full responsibility for complete structural design and construction of formwork in accordance with CSA Standard S269.1.
 - .2 Perform structural design of formwork for suspended concrete structural members by a professional engineer experienced in design of formwork and licensed to practise at location of Project. His responsibility shall include design of formwork and shoring, review of drawings related to this Work, field review of formwork construction including stripping and reshoring, and when requested by regulatory agencies, or Consultant, submission of written reports of site review of formwork and shoring.
- .4 Regulations:
- .1 Abide by current bylaws and regulations of the province and/or municipality in which Work is located, and abide by current laws and regulations with regard to public safety.

Concrete Formwork

- .2 Regulations of the Minister of Labour, Occupational Health and Safety Act, the Workers' Compensation Board and other applicable acts administered by authority having jurisdiction of the province apply to Work of this Section.

.5 Safety

- .1 Carry out concrete formwork in accordance with the Ontario Building Code and current Occupational Health and Safety Act construction safety regulations.

.6 Tolerances:

The indicated tolerances govern unless otherwise specified. Concrete construction shall meet the specified tolerances. Tolerances are not cumulative. The most restrictive tolerance controls. Plus (+) tolerance increases the amount of dimension to which it applies, or raises a level alignment. Minus (-) tolerance decreases the amount of dimension to which it applies, or lowers a level alignment. A nonsigned tolerance means + or - . Where only one signed tolerance is specified (+ or -), there is no limit in the other direction.

.1 Definitions:

Arris – The line, edge, or hip in which two straight or curved surfaces of a body, forming an exterior angle, meet; a sharp ridge, as between adjoining channels of a Doric column.

Bowing – The displacement of the surface of a planar element from a plane passing through any three corners of the element.

Clear distance – In reinforced concrete, the least distance between the surface of the reinforcement and the referenced surface, i.e., the form, adjacent reinforcement, embedment, concrete, or other surface.

Concealed surface – Surface not subject to visual observation during normal use of the element.

Cover – In reinforced concrete, the least distance between the surface of the reinforcement and the outer surface of the concrete.

Flatness – The degree to which a surface approximates a plane.

Lateral alignment – The location relative to a specified horizontal plane or line, or to a point in a horizontal plane.

Level alignment – The location relative to a specified horizontal plane.

Levelness – The degree to which a line or surface parallels horizontal.

Relative alignment – The distance between two or more elements in any plane, or the distance between adjacent elements, or the distance between an element and a defined point or plane.

Concrete Formwork

Tolerance – The permitted variation from a given dimension or quantity. The range of variation permitted in maintaining a specified dimension. A permitted variation from location or alignment.

Specified surface, plane, or line – A surface, plane, or line specified by the Contract Documents; specified planes and lines may slope and specified surfaces may have curvature.

Vertical alignment – The location relative to specified vertical plane or a specified vertical line or from a line or plane reference to a vertical line or plane. When applied to slabs, ramps, or other nominally horizontal surfaces established by elevations, vertical alignment is defined as the vertical location of the surface relative to the specified profile grade and specified cross slope.

Warping – The displacement of the surface, portion, or edge of a planar element from a plane passing through any three corners of the element.

Class of Surface:

Class A – For surfaces prominently exposed to public view where appearance is of special importance.

Class B – Coarse-textured concrete-formed surfaces intended to receive plaster, stucco, or wainscoting.

Class C – General standard for permanently exposed surfaces where other finishes are not specified.

Class D – Minimum quality surface where roughness is not objectionable, usually applied where surfaces will be concealed.

.2 Footings:

.1 Lateral Alignment:

- Eccentricity measured from centre of gravity of footing as cast to the centre of gravity as specified; 0.02 times width of footing in direction of misplacement, but not more than50 mm (2")
- Supporting masonry.....12 mm (1/2")

.2 Level alignment:

- Top of footings supporting masonry12 mm (1/2")
- Top of other footings..... +12 mm (+1/2)
 -50 mm (-2")

.3 Cross-sectional dimensions:

- Horizontal dimension of formed members..... +50 mm (+2")
 -12 mm (-1/2")

Concrete Formwork

- Horizontal dimension of unformed members cast against soil:
 - 600 mm (2 ft) or less..... +75 mm (+3")
-12 mm (-1/2")
 - greater than 600 mm (2 ft) but less than 1.8 m (6 ft) +150 mm (+6")
-12 mm (-1/2")
 - over 1.8 m (6 ft) +300 mm (+12")
-12 mm (-1/2")
- .4 Vertical dimension (thickness)-5 percent
- .5 Relative alignment:
 - Footing side and top surfaces may slope with respect to the specified plane at a rate not to exceed the following amount in 3 m (10 ft).....25 mm (1")
- .3 Other Cast-in-Place Concrete:
 - .1 Vertical Alignment:

For heights 30 m (100 ft) or less:

 - Lines, surfaces, and arises25 mm (1")
 - Outside corner of exposed corner columns and control joint grooves in concrete exposed to view12 mm (1/2")

For heights greater than 30 m (100 ft):

 - Lines, surfaces, and arises 1/1000 times the height, but not more than.....150 mm (6")
 - Outside corner of exposed corner columns and control joint grooves in concrete, 1/2000 times the height, but not more than75 mm (3")
 - .2 Lateral Alignment:
 - Members25 mm (1")
 - In slabs, centreline location of openings 300 mm (1 ft) or smaller, and edge location of larger openings12 mm (1/2")
 - Sawcuts, joints, and weakened plane embedments in slabs.....20 mm (3/4")
 - .3 Level alignment:
 - Top of slabs:
 - Elevation of slabs-on-grade.....20 mm (3/4")
 - Elevation of top surfaces of formed slabs before removal of supporting shores.....20 mm (3/4")

Concrete Formwork

- .6 Openings through members:
 - Cross-sectional size of opening..... -6 mm (-1/4")
+25 mm (+1")
 - Location of centreline of opening..... 12 mm (1/2")
- .7 Quality Control
 - .1 The Contractor's professional engineer responsible for design of formwork is to inspect fabrication and erection of formwork in accordance with PEO Guidelines for Performing Structural Engineering for Buildings.
 - .2 The Contractor shall not assign responsibility of coordination of forming and placing other required material. Ensure full-time qualified superintendent representing the Contractor is in attendance to inspect and check all phases of this Work.

1.4 Submittals

- .1 General
 - .1 Submit proposed joint details, locations and construction procedures. Include waterstop, crack inducer, reglet, sealant and joint filler products as required.
 - .2 Submit responses to site review reports stating that all reported defects and deficiency items were corrected or stating what action was taken.
- .2 Professional Liability Insurance:
 - .1 Submit proof of formwork design engineer's professional liability insurance coverage specified in paragraph 1.3.2.
- .3 Shop Drawings
 - .1 Submit shop drawings of formwork, shoring and re-shoring in accordance with Section 01 30 00 and as specified below. Copies of portions or all of the structural drawings will not be accepted as shop drawings.
 - .2 Each shop drawing submitted shall bear the seal and signature of the Professional Engineer responsible for formwork design.
 - .3 Indicate: materials, sizes, grades, methods of construction, arrangement of joints, ties, shores, falsework, dimensions, spacings, schedule of erection, rate and sequence of concrete placement, stripping requirements and design parameters.
 - .4 Submit shop drawings to Consultant of exposed concrete formwork if requested by the Consultant indicating placement joints, control joints, lay out of panels, form ties, corner details, and false joint patterns and all proposed tie patterns.

Concrete Formwork

- .5 Clearly indicate all pertinent dimensioning, arrangements of joints, location of reglets, reveals and tie patterns; type, extent and locations of items to be built into concrete.
- .6 Where complicated inward sloped forms are required, indicate construction methods and materials proposed to achieve clean, smooth or straight concrete lines and smooth even surfaces free from bugholes, honeycombs and cold joints.
- .7 Sleeving Drawings:
 - .1 Submit drawings showing sleeves of all disciplines required through floors, roof and other structural members.
 - .2 Submit drawings showing size and spacing of conduits and piping, if requested by Consultant.
 - .3 Coordinate with other Divisions prior to submittal.
- .8 Prior to submission to Consultant, Contractor shall review all shop drawings. By this review, Contractor represents to have determined and verified all field data, site conditions, materials, catalogue number and similar data, and to have checked and coordinated each shop drawing with requirements of Work and of Contract Documents. Contractor's review of each shop drawing shall be indicated by stamp, date and signature of the Contractor's representative.
- .9 At time of submission, Contractor shall notify Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.
- .10 Consultant will review and return shop drawings in accordance with an agreed schedule. Consultant's review is intended as an assistance to the Contractor and will be for conformity to design concept and for general arrangement, and shall not relieve the Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of Contract Documents.
- .11 Contractor shall make changes in shop drawings, which Consultant may require, consistent with Contract Documents and resubmit unless otherwise directed by Consultant. When resubmitting, Contractor shall notify Consultant in writing of revisions other than those requested by Consultant.
- .12 Do not commence placing sleeves, conduits or piping before drawings have been reviewed and Consultant's comments incorporated on drawings issued to site.
- .13 Assume responsibility for accuracy of Work. Review of submitted shop drawings does not relieve Contractor from compliance with requirements of Contract Documents.
- .14 Fabrication and construction that commences prior to shop drawing review by the Consultant is at the Contractor's risk.
- .15 Submit shop drawings as follows:
 - 1 copy for review before any Work commences.

Concrete Formwork

- 1 additional copies of shop and erection drawings for distribution as directed by Consultant.
- 1 copy of reviewed shop and erection diagrams to Inspection and Testing Company

.16 Required by Regulatory Agencies:

Submit shop drawings bearing signature and seal of Professional Engineer responsible for formwork design, as may be required by regulatory agencies. Proceed with construction of formwork only with their approval.

1.5 Delivery, Storage and Handling

- .1 Deliver all materials to the site in bundles easily identified and properly marked.
- .2 Store and handle all material on site in a manner to prevent damage and contamination.
- .3 Protect formwork to prevent functional damage and damage to faces affecting appearance of concrete surfaces exposed to view.
- .4 Prevent damage to fibre column forms, and protect against moisture.

1.6 Payment

- .1 Payment for the work of this Section shall be on a lump sum basis as tendered which shall be full compensation for all labour, materials, and equipment necessary to complete the Work, including all subsidiary and incidental items thereto for which separate payment is not elsewhere provided.

PART 2 - PRODUCTS

2.1 Unit Prices

- .1 Unit prices requested as part of the Tender shall include formwork materials, erection, bracing, shoring, incorporation of built-in items, release agent, stripping and removing, and preparation and submittal of necessary shop and erection drawings.
- .2 Unit prices to be applied to the net area difference.
- .3 Submit unit prices with the Tender Form for the addition and deletion of the following:
 - .1 Slab formwork Per m²
 - .2 Column formwork (square or rectangular) Per m²
 - .3 Round column formwork Per m²
 - .4 Footing formwork Per m²
 - .5 Beam formwork Per m²

Concrete Formwork

- | | | |
|----|---------------------------------|--------------------|
| .6 | Wall and grade beam formwork | Per m ² |
| .7 | Architectural concrete formwork | Per m ² |

2.2 Materials

- .1 Generally in accordance with Reference Standards.
- .2 Formwork materials brought on site shall be new.
- .3 Plywood:
 - .1 Generally:

Douglas fir conforming to CSA-O121 or softwood conforming to CSA-O151, minimum thickness of 17.0 mm, as required to resist design loads imposed upon forming system. Finished one side, fabricated specially for use as concrete form panels, with sealed edges. Sound, undamaged sheets with clean, true finish.
 - .2 For concrete surfaces exposed to view, provide panels smooth and free of defects which would be reproduced as concrete blemishes.
 - .3 Where surfaces receive architectural finishing, such as sandblasting or bush-hammering, use coated or overlaid form panels: as Sylvaform by Weyerhaeuser Company.

Re-use no more than five times. Allow Consultant to inspect before each use.
- .4 Lumber: Fir or spruce species, #2 Grade or better, conforming to CSA-O141 and to design requirements of CSA-O86.1 to resist applied loads required of forming system.
- .5 Anchorage devices (including nails, bolts, spikes and lag screws): Sized to ensure all formwork loadings are adequately resisted. Nails, spikes and staples conforming to CSA-B111, galvanized or phosphatized.
- .6 Steel forms: Minimum 1.6 mm (1/16") well matched, tight fitting and adequately stiffened to support weight of concrete without deflection.
- .7 Form ties for concrete below grade or exposed to weather.
 - .1 Snap off metal ties with spreader washer, 50 mm (2") length cone to resist all forces.
- .8 Form ties for concrete with unexposed finishes or concrete covered by an applied architectural finish:
 - .1 Snap off metal ties, with spreader washer, to resist all forces, that will break off approximately 15 mm (5/8") below the surface and permit a flush finish.
- .9 Form ties for exposed concrete including painted and/or epoxy-coated concrete, unless specifically exempted on Drawings or in room finish schedules:

Concrete Formwork

- .1 Removable ties to resist all forces that will permit a recessed or flush finish. Pattern to be symmetrical to approval of Consultant.
- .2 Snap off metal ties, with spreader washer, 50 mm (2") length cone to resist all forces to permit a recessed finish. Pattern to be symmetrical to approval of Consultant.
- .3 Metal type of fixed or adjustable length to resist all forces, with plastic cones, free of defects that will leave holes larger than 30 mm (1 1/8") in concrete surface and compatible with plugs. Pattern to be symmetrical to approval of Consultant.
- .10 Form tie hole sealant: One-component polymeric sealant. Natural grey or colour to match concrete.
- .11 Form release agent: Colourless, non-staining, non-volatile type. For architectural exposed concrete finishes, use low viscosity agent to eliminate bugholes.
- .12 Fillets for chamfered corners: Minimum 12 mm x 12 mm (1/2" x 1/2") wood.
- .13 Forms for Concrete Joists: reusable metal forms, fabricated of gauge to provide adequate strength and of profile approved by Consultant.
- .14 Round Column Fibre Forms:
 - .1 Designed to resist all imposed loads.
 - .2 If not available in metric, notify Consultant of proposed substitution and obtain approval.
 - .1 To produce smooth surface without fins, of uniform texture and appearance.
:Burke Smooth Tube with PVC liner, by Aluma International.
:Poli-Permaform with polystyrene liner, by Perma Tubes Ltd.
 - .2 To produce smooth surface without fins.
:Sonotube Seamless fibre form, strippable type, by Sonoco Limited.
 - .3 Strippable fibre forms
:Sonotube "A" Coated, by Sonoco Limited.
 - .4 Fibre forms for concealed surfaces.
:Sonotube "W" Coated, by Sonoco Limited.
 - .5 Metal forms
To resist all loads.
- .15 Void form: Closed celled expanded polystyrene complete with void spaces specifically designed to allow frost heave and swelling of soil under concrete without inducing uplift on concrete. Structurally sufficient to support weight of wet concrete 150 mm (6") thick.

Concrete Formwork

- .16 Void forms: Honeycomb cellular core structure manufactured from Kraft fibre. Top and sides protected with wax coated corrugated board, and bottom unprotected, with minimum compliance strength of 0.12 MPa, 150 mm (6") thick.
:Wamat (by Shearmat Structures Ltd., Winnipeg, Manitoba), distributed by National Concrete Accessories (Acrow-Richmond), Rexdale, Ontario. (Note one to two week delivery period).
- .17 Grade beam and wall void form protection: Provide polyethylene protection under biodegradable void form as required to protect void form from moisture and premature failure prior to placing concrete.
- .18 Structural slab on grade void form protection: Provide plywood or hard board as required over void form to protect form from crushing under construction activities and reinforcement chairing.
- .19 Void protection: Wood preserved pressure treated plywood, 12 mm (½") thick by 250 mm (10" ea.) high each side of biodegradable void form to ensure void space.
- .20 Vertical Drainage Pans: Prefabricated high-impact polymeric drain core with bonded non-woven geotextile fabric.

:Terra Drain 600, by Terrafix Geosynthetics Inc., Rexdale, Ontario
:Delta-Drain 6000, by Cosella Drain Products, Beamsville, Ontario
:Grace Hydroduct 200, by W.R. Grace & Co., Cambridge, Mass.
:Wet Drain 5035, by W.R. Meadows of Canada Ltd.
- .21 Joint Tape: Non-staining, water impermeable, self-release, as approved by Consultant.

PART 3 - EXECUTION

3.1 General

- .1 Perform concrete formwork and falsework in accordance with requirements of CSA-A23.1 unless indicated otherwise on Drawings.

3.2 Earth Forms

- .1 Earth forms are not acceptable.
- .2 Where soil conditions are suitable, earth forms for wall foundations may be used with Geotechnical Engineer's and Consultant's approval.
- .3 Trim edges of excavation vertical and smooth. Completely remove trimmings. Increase concrete cover as required.
- .4 Install wood stringers for suspension of reinforcement.
- .5 Install wood forms where earth form sides have collapsed.

Concrete Formwork

3.3 Formwork Erection

- .1 Verify lines, levels and centres before proceeding with formwork. Ensure that dimensions agree with Drawings.
- .2 Ensure that supplied equipment, hardware, and items to be cast-in will fit concrete dimensions.
- .3 Construct formwork, shoring and bracing accurately to meet design and code requirements so that resultant finished concrete conforms to shapes, lines, levels and dimensions indicated on Drawings.
- .4 Provide bracing to ensure stability of formwork as a whole. Prop or strengthen previously constructed elements liable to be overstressed by construction loads.
- .5 Arrange and assemble formwork so as to permit easy dismantling and stripping so that concrete is not damaged during its removal.
- .6 Align joints and make watertight to prevent leakage of grout or cement paste and disfigured appearance of concrete. Keep form joints to a minimum. Obtain approval of Consultant for location of form joints in exposed work.
- .7 Chamfer external corners and edges of columns when exposed or as noted.
- .8 Construct formwork to maintain concrete tolerances in accordance with CSA-A23.1, Clause 10 and paragraph 1.3.6.
- .9 Camber beams: 0.2% of span unless otherwise noted.
- .10 Camber slabs: 0.1% of span for all spans over 3 m (10 ft).
- .11 Do not re-use formwork with surface defects that will impair appearance of finished concrete. Do not patch formwork. Meet requirements of Part 2 of this Section when re-using formwork.
- .12 Bed mud sills on sand, gravel or crushed stone placed over unfrozen, dry, solid and stable subgrade.
- .13 Provide recesses in top of foundation walls at doors and openings to allow slab to bear on walls.
- .14 Forms for Surfaces to be Waterproofed:
 - .1 Construct forms with joints taped and edges backed to prevent separation of plywood panels at joints.
 - .2 For metallic or chemical waterproofed surfaces, form continuous reglets at junctions of floors and walls and at other locations noted on Drawings.
- .15 Forms for Architectural Concrete Surfaces or Surfaces which will be Exposed or Painted:

Concrete Formwork

- .1 The intent of this Section is to ensure that formwork is of high quality to result in exposed concrete surfaces free of unsightly cold joints, blemishes, bugholes, honeycombing and cracking. Acceptable symmetrical joint patterns are mandatory.
- .2 Formwork to be in accordance with CSA-A23.1, Clause 28.
- .3 Allow Consultant to inspect and approve each section of formwork prior to placing reinforcement.
- .4 Construct panels with full size plywood sheets as far as possible, and continuous and level horizontal joints, unless otherwise indicated on Drawings.
- .5 Back edges of plywood to prevent separation of plywood panels at joints.
- .6 Construct corners so that concrete is not placed against panel edges.
- .7 Seal joints between panels including corners with joint tape to prevent bleeding of fines.
- .8 Where tie marks will show, place ties in regular pattern as approved by Consultant or as indicated on Drawings.
- .9 Reuse forms only if their surfaces are not marred in any manner and where established pattern of holes can be maintained with no alteration to panels.
- .10 Control joint and placement break spacings outlined on structural drawings are maximum allowable. More frequent spacings may be required to conform to architectural requirements.
- .11 All horizontal and vertical joints are to result in satisfactory symmetrical pattern approved in advance of forming by Consultant.
- .12 Horizontal joints are to extend on all sides of a given space or spaces at the same elevation, unless otherwise detailed.
- .13 Allow for horizontal joints at the top of all openings, and extend as required, unless otherwise detailed.
- .14 as required, unless otherwise detailed.
- .15 Allow for vertical joints each side of openings, and extend to underside of slabs or deck unless otherwise detailed.
- .16 Horizontal reglets to be placed on both sides of placement breaks in walls, railings, beams and/or slabs.
- .17 V-joints or reglets in walls and railings to also extend over top of the wall or railing.

Concrete Formwork

- .18 Provide V-joints and reglets to forms at vertical and horizontal placement breaks and as noted or detailed. Caulk V-joint and reglet formwork to prevent bleeding of fines from concrete.
- .19 Replace damaged forms and forms with poor surfaces with new material as directed by the Consultant.
- .16 Vertical Drainage Pans:
 - .1 Install vertical drainage pans with 100% continuous covering of all foundation wall exterior surfaces. Install and secure in place in accordance with manufacturer's instructions over surface that has been prepared in accordance with manufacturer's recommendations.
 - .2 Top of drain pans to be 150 mm (6") below final grade.
 - .3 Install moulding strips at terminated edges to preclude materials from entering the core.
 - .4 Fasteners and sealants to manufacturer's specifications.
 - .5 Lap and seal membrane and drainage core as per manufacturer's recommendations.
 - .6 Manufacturer's representative to visit site periodically during installation and confirm in writing that installation is in accordance with manufacturer's instructions. Inspection shall include review of substrate, review of finished product for appropriate fasteners, and sealing of overlap joints.
- .17 Caissons and Piles
 - .1 Verify top of pile and caisson elevations. Cut down piles or caissons or increase lengths as required to proper elevations. Ensure piles or caissons project into grade beams and pile caps as indicated on Drawings.
 - .2 Remove loose concrete, soil inclusions and laitance from tops of piles or caissons. Ensure tops of piles or caissons are clean and of sound concrete.
- .18 Elevation Survey:
 - .1 Before every pour of slabs spanning more than 8 m, as agreed with Consultant, survey area and record elevation of top surface of soffit formwork at each column or other permanent support, at mid-point between columns, and at centre of each bay area.
 - .2 Provide Consultant with one copy of formwork elevation survey before each pour.
- .19 Advise Consultant when an area of formwork will be ready for review. Allow sufficient time for review before starting concrete placing.

Concrete Formwork

3.4 Built-In Work

- .1 Form openings and build in anchors, inserts, sub-frames, sleeves, miscellaneous metal items, flashing reglets and similar items furnished under Work of other Sections, which are indicated on Drawings and on shop drawings of other trades, and as required for proper completion of Project.
- .2 Accurately locate and set in place items that are to be cast directly in concrete.
- .3 Coordinate Work of other Sections and cooperate with the trade involved in forming and/or setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts. Do not perform Work unless specifically indicated on Drawings or approved prior to installation.
- .4 Do not place anchor bolts, sleeves and inserts into freshly placed concrete.
- .5 Install concrete accessories in accordance with Drawings and manufacturer's recommendations, straight, level and plumb. Ensure adequate support to prevent movement during concrete placement.
- .6 Do not embed wood in concrete.
- .7 Anchor Bolts:
 - .1 Use template to position anchor bolts.
 - .2 Tie anchor bolts securely in position to prevent movement during concrete placing.
 - .3 Verify that anchor bolts have specified projection above concrete.
- .8 Openings or Sleeves Not Shown on Structural Drawings:
 - .1 Obtain Consultant's written approval before forming openings or sleeves through columns and beams, or through slabs within 1 m (3'-3") of their supports.
 - .2 Obtain Consultant's written approval before forming openings or sleeves larger than 200 mm (8") square in any location.
 - .3 Do not relocate or interfere with bottom bar structural integrity reinforcement which extends from column to column. Report any interferences to Consultant.
 - .4 Conform to requirements of CSA A23.1, Section 13.5.
- .9 Embedded Pipe or Conduit Not Shown or Detailed on Structural Drawings:
 - .1 Obtain Consultant's written approval before placing conduit or pipe which would be embedded in finished structure.
 - .2 Conform to requirements of CSA A23.1, Section 13.5.

Concrete Formwork

- .3 So as not to impair the required strength of the structure, the following criteria are to be followed:
 - .1 Where conduit or pipes pass by a column stay at least two times the thickness of the slab and drop away from the column.
 - .2 Where conduits or pipes terminate adjacent to a column or wall, bring the conduit or pipe in toward the column/wall as close to 90 degrees to the face of the column as possible within two times the thickness of the slab and drop away from the column.
 - .3 Maximum size of conduit in structural slabs is 1/5 of solid portion of slab thickness, and where more than two are adjacent to each other, they are to be spaced the greater of 100 mm (4") or 3 diameters apart.
 - .4 The total of depth of conduits and pipes crossing over each other is to be less than one third the thickness of the slab.
 - .5 Place conduit in the middle third of the thickness of the slab. Do not allow conduit or pipe to lay directly on the reinforcing steel.
 - .6 Do not allow conduit or pipes to run adjacent to parallel reinforcing bars.
 - .7 Do not run conduit or pipes longitudinally in a beam without specific approval of (Consultant). Pass through beams at right angles to the span of the beam.
 - .8 Where conduits or pipes pass through beams, stay at least twice the depth of the beam away from the supports.
 - .9 Do not run conduit or pipes in the slab beside a drop or beam within twice the depth of the slab from the edge of the drop or beam.
 - .10 No conduits or sleeves are to run through shear walls or columns without the specific approval of Consultant.
- .10 Confirm that built-in items that penetrate surface waterproofing are installed to meet requirements of waterproofing trade.

3.5 Construction & Expansion Joints

- .1 Construction joints in addition to those indicate on Drawings may be required to execute Work in accordance with concrete placing schedule. Provide such construction joints without extra compensation.
- .2 Prepare surface of concrete in accordance with CSA A23.1, Clause 20.1, Construction Joint, to produce a bonded concrete joint.
- .3 Form construction and expansion joints with bulkheads to ensure straight lines.
- .4 Immediately before subsequent pour at a construction joint, remove bulkhead and tighten forms so that concrete surfaces will be on same plane with no overlapping of concrete.

Concrete Formwork

- .5 Review with Consultant and Structural Engineer proposed location and details of construction joints in walls, columns, beams, slabs and other structural elements.
- .6 Construction Joints
 - .1 Construction joints shall present appearance of normal form panel joint.
 - .2 Install continuous shear key in construction joints in walls and framed floors which are 150 mm (6") or more thick. Form keys 40 mm (1½") deep by 1/3 of member thickness, unless noted otherwise.
 - .3 Locate construction joints in framed floors or grade beams at point in span where shear will be equal to zero (normally at midspan under uniformly distributed load).
 - .4 Locate construction joints in concrete slabs supported by steel beams at centre of steel beam.
 - .5 Provide vertical construction joints in walls at not more than 23 m (75 ft) centre to centre, and in exposed-to-the-exterior retaining walls and grade beams at not more than 12 m (40 ft) centres. Locate construction joints directly over centroid of pile, caisson or pile cap. In walls immediately above and below floor construction joints.
 - .6 Provide construction joints at centre of span of suspended slabs, beams and joists, adequately doweled and keyed. Maximum concrete placement length for structural slabs to be 30 m (100 ft) unless otherwise detailed. Refer to Drawings for construction joint details.
 - .7 Provide construction joints in slabs on grade, at maximum 24 m (80 ft) or as detailed.
 - .8 Provide construction joints in walls that are watertight at spacing not to exceed 10 m (33 ft) with locations approved prior to construction.
 - .9 Construction Joints in Unrestrained Slabs on Ground
 - .1 Slabs may be placed continuous from outside edge to outside edge, outside edge to expansion joint, or from expansion joint to expansion joint, unless shown otherwise.
 - .10 Construction Joints in Suspended Slabs Restrained by Connecting Walls
 - .1 Place slab in alternate strips with the larger dimension of any single placement no greater than the following:
 - .1 10 m (33 ft) for slabs forming part of liquid holding structure.
 - .2 15 m (50 ft) for slabs of other than liquid holding structure.
 - .2 Locate construction joints in suspended slabs near the middle quarter of the spans of slabs and beams, unless indicated otherwise on the

Concrete Formwork

Drawings. If a beam intersects a girder at this location, offset the construction joint in the slab and girder by a distance equal to two times the width of the beam.

.11 Construction Joints in Walls

- .1 Locate construction joints 2 m (6'-6") minimum away from junction of two or more walls, a column or beam supported on wall, nearest edge of an opening wider than 600 mm (24"), and a construction joint in a slab on which the wall rests.
- .2 Place wall in alternate portions with a distance between vertical construction joints not exceeding the following:
 - .1 10 m (33 ft) for walls forming part of liquid holding structure.
 - .2 15 m (50 ft) for walls of other than liquid holding structure.

.12 Roughen surface of construction joints immediately upon removal of formwork to sound concrete, apply an epoxy bonding agent prior to placing fresh concrete.

.7 Expansion Joints:

- .1 Install expansion joints in locations and as detailed and noted on Drawings.
- .2 In exterior cantilever retaining walls locate expansion joints at 12 m (40 ft) centres, maximum.

3.6 Cleaning Forms

- .1 Clean forms as erection proceeds to remove foreign matter. Remove cuttings, shavings and debris from within forms. Flush completely with water or compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- .2 During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out completed forms unless formwork and concrete construction proceed within a heated enclosure. Use compressed air or other means to remove foreign matter.
- .3 Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close temporary ports or openings with tight-fitting panels, flush with inside of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

3.7 Treatment of Formwork Surfaces

- .1 Form Release Agent:
 - .1 Coat formwork with form release agent before reinforcement, anchors, accessories, and other built-in items are installed, in accordance with manufacturer's recommendations.

Concrete Formwork

- .2 Do not coat plywood forms pretreated with release agent.
- .3 On surfaces to receive finish materials, adhesives, sealers, paint or other coatings or materials, use a compatible release agent.

3.8 Stripping of Formwork

- .1 Elevation Survey:
 - .1 Before removing shores prior to stripping soffit forms, survey pour area and record elevation of finished concrete top surface in same locations as specified in paragraph 3.3.18.
 - .2 Provide Consultant with copy of survey.
- .2 Comply with CSA-S269.1 for dismantling all falsework.
- .3 Do not remove forms, shores and bracing until concrete has gained sufficient strength to carry its own weight, construction loads and design loads that are liable to be imposed upon it.
- .4 Arrange forms to allow removal without removal of principal shores where these are required to remain in place.
- .5 Be responsible for safety of structure, both before and after removal of forms, until concrete has reached its specified 28 day strength.
- .6 Strip formwork for soffits of beams, slabs and other spanning members which support weight of concrete only when concrete has reached its specified 28 day strength, except as specified hereafter.
- .7 Formwork may be stripped when concrete has reached 75% of specified 28 day strength, but only in accordance with re-shoring procedures, specified in this Section.
- .8 Verify strength by field cylinders or insert type tests in accordance with ASTM C900-T.
- .9 Remove formwork progressively and in accordance with code requirements so that no shock loads or unbalanced loads are imposed on structure.
- .10 Strip formwork on vertical surfaces when concrete has hardened sufficiently that no damage will result from stripping operations but not before a minimum of three days from final concrete placement to prevent rapid loss of moisture from concrete.
- .11 Leave plywood forms in place as long as possible to permit maximum shrinkage away from concrete.
- .12 Remove formwork at architectural concrete surfaces after other formwork has been removed, to prevent damage to surfaces.
- .13 Do not remove plywood formwork by jerking loose, by metal pinch bars, hammers or tools. Use wood wedges and gradually force panels loose.

Concrete Formwork

- .14 Take particular care not to damage external corners when stripping formwork.
- .15 When forms are stripped during curing period, cure and protect exposed concrete in accordance with Section 03 30 00.

3.9 Re-Shoring

- .1 Re-shore concrete when formwork is stripped, as follows:
 - .1 When floor is to support weight of newly placed concrete from floor(s) above during construction, re-shore and maintain in place as specified in paragraph 3.9.7.
 - .2 When floor is not required to support weight of newly placed concrete from floor(s) above during construction, and formwork is stripped before specified 28 day strength is attained, re-shore and maintain in place until specified 28 day strength is reached.
- .2 Submit for Consultant's review proposed schedule for stripping, methods of re-shoring, and controls to prove that 75% of specified 28 day strength of concrete has been reached.
- .3 Re-shore in two directions so that no large areas of Work are permitted to support their own weight.
- .4 Locate re-shores at midspan of members, but at no greater spacing than 3 m (10 ft) centres.
- .5 Place each tier of shoring concentric with the one below.
- .6 Tighten re-shores to carry weight of new construction and any load imposed thereon. Do not overstress new construction by overtightening.
- .7 Leave at least two storeys of shores or re-shores in place beneath framed floors which support weight of newly placed concrete above, and until newly placed concrete has reached at least 75% of its specified 28 day strength.

3.10 Certification

- .1 At the completion of formwork and shoring, certify all formwork components fabricated and erected by the Contractor under seal and signature of Contractor's professional engineer responsible for this Work.
- .2 Certify that formwork, shoring and components are capable of supporting construction loads and forces required to complete cast-in-place concrete Work.
- .3 Certify that formwork, shoring and components are fabricated and erected in accordance with reviewed shop drawings.

3.11 Defective Work

Concrete Formwork

- .1 Variations in excess of specified tolerances and failure of materials or workmanship to meet requirements of this specification will be considered defective Work performed by this Section.
- .2 Replace defective Work, as directed by Consultant.
- .3 Contractor shall pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work is deficient. Costs for additional inspection, testing, review and redesign to be deducted from Contract Value.
- .4 Movement and displacement of formwork during construction, variations in excess of specified tolerances and marked and disfigured surfaces will be considered defective Work performed by this Section.
- .5 Reconstruct defective formwork and replace concrete and reinforcement placed in defective formwork at no additional cost to Owner.

END OF SECTION

Concrete Accessories

PART 1 - GENERAL

1.1 General Requirements

- .1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.
- .2 Quantities and dimensions enclosed in brackets apply to Project for which Drawings are in imperial units.

1.2 Description

- .1 Related Work Specified in Other Sections
 - .1 Submittals and Shop Drawings Section 01 30 00
 - .2 Quality Control Section 01 40 00
 - .3 Excavation and Backfill Section 31 23 10
 - .4 Excavated Caissions Section 31 63 23
 - .5 Concrete Forms Section 03 10 00
 - .6 Concrete Reinforcement Section 03 20 00
 - .7 Cast-In-Place Concrete Section 03 30 00
 - .8 Special Concrete Finishes Section 03 35 00
 - .9 Concrete Floor Finishes Section 03 35 00
 - .10 Grout Section 03 37 00
 - .11 Supply of Anchor Bolts, Plates and Accessories for Structural Steel Work (to be Built into Forms) Section 05 12 00
 - .12 Preparing Concrete Surfaces to Receive Dampproofing and Waterproofing Section 07 12 00 and
 - .13 Mechanical Items (to be Built into Forms) Division 21, 22 and 23
 - .14 Electrical Items (to be Built into Forms) Division 26, 27 and 28
- .2 Work Supplied but Installed under Other Sections
 - .1 Supply materials specified to be installed under other Sections of these project specifications. Materials include but are not limited to:
 - .1 Fabricated components, anchor bolts, bearing plates, sleeves and other inserts to be built into concrete.

Concrete Accessories

- .2 Ensure installation is to satisfaction of trades concerned and of Consultant.
- .3 Cooperation with Work of Other Sections:
 - .1 Check project Drawings and Specifications for requirements of other Sections, which will affect installation of Work of this Section.
- .4 Co-operation with Consultant:
 - .1 Before commencing Work, review with Consultant, Work performed under this Section.
 - .2 Schedule Work to allow sufficient time and access for Consultant to carry out periodic field review.
- .5 Cooperation with Inspection and Testing Company:
 - .1 Provide free access to Work.

1.3 Quality Assurance

- .1 Reference Standards & Publications:
 - .1 All standards to be latest issue at time of tender.
 - .2 Provide one copy on site of the first three standards listed below.
 - .3 The following reference standards shall govern Work of this Section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following Standards apply but are not necessarily repeated in following list:
 - .1 2012 OBC, "Ontario Building Code".
 - .2 CSA-A23.1-19, "Concrete Materials and Methods of Concrete Construction".
 - .3 CSA-A23.3-19, "Design of Concrete Structures for Buildings".
 - .11 Ontario Provincial Standard Specification OPSS 1010, "Aggregates – Base, Subbase, Select Subgrade, and Backfill Material (2013 Edition)".
 - .12 Ontario Provincial Standard Specification OPSS 1212, "Hot-Poured Rubberized Asphalt Joint Sealing Compound (2021 Edition)".
 - .13 ASTM C309-19, "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete".
 - .14 ASTM D1751-18, "Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)".

Concrete Accessories

- .15 ASTM D1752-18, "Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction".
 - .16 ASTM E154/ E154M-08a (R2019), "Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs".
 - .17 .ASTM E96/ E96M-22ae1, "Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials".
 - .18 ASTM E1643-18a, "Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs".
 - .19 ASTM E1745-17 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - .20 ASTM F1249-20 Standard Test Method for Water Vapor Transmission Rate through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
 - .21 American Society for Testing and Materials (ASTM) where noted.
 - .22 American Concrete Institute Detailing Manual (ACI 315-18) where noted.
 - .23 Provincial safety standards where applicable.
 - .24 Conform to applicable safety regulations for erection, maintenance and removal of formwork.
- .2 Regulations
- .1 Abide by current bylaws and regulations of province and/or municipality in which Work is located, and abide by current laws and regulations with regard to public safety.
 - .2 Regulations of the Minister of Labour, Occupational Health and Safety Act, the Workers' Compensation Board and other applicable acts administered by authority having jurisdiction of province apply to Work of this Section.
- .3 Safety
- .1 Carry out concrete accessories work in accordance with the Ontario Building Code and current Occupational Health and Safety Act construction safety regulations.
- .4 Source Quality Control:
- .1 Inspection and testing materials and fabrication of Work of this Section, and field quality control specified elsewhere in this Section, may be performed by an Inspection and Testing Company appointed by Consultant.

Concrete Accessories

- .2 Review provided by Inspection and Testing Company does not relieve Contractor of his sole responsibility for quality control over work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of this specification.
- .3 Inspection and Testing Company shall be certified by Canadian Welding Bureau, to CSA W178.1, Category 1, Buildings.
- .4 Welding inspectors and supervisors shall be certified by Canadian Welding Bureau to CSA W178.2.
- .5 Payment for specified Work performed by Inspection and Testing Company will be made from cash allowance specified in Section 01 20 00.
- .6 Provide access for inspection to all places where Work is manufactured, stockpiled or installed.

1.4 Submittals

- .1 Submit data on concrete accessories specified or proposed.
- .2 Submit proposed joint details, locations and construction procedures. Include waterstop, crack inducer, reglet, sealant and joint filler products as required.
- .3 Submit proposed procedures for applying separate floor topping.
- .4 Submit responses to site review reports stating that all reported defects and deficiency items were corrected or stating what action was taken.
- .5 Submit samples of:
 - .1 PVC waterstop, spliced horizontal and vertical crosses, tees, and ells.
 - .2 Joint fillers.
 - .3 Neoprene waterstop expansion joint system.
 - .4 Hydrophilic waterstop.
 - .5 Aluminum expansion joint system.
 - .6 Neoprene compression seal.
- .6 Submit three copies of manufacturer's product data sheets including installation, application, and maintenance instructions for:
 - .1 PVC waterstops.
 - .2 Neoprene waterstop expansion joint system.
 - .3 Neoprene compression seal system.

Concrete Accessories

- .4 Foamed PVC joint filler.
- .5 Preformed joint filler.
- .6 Asphalt-impregnated fibre board.
- .7 Adhesive for expansion joint filler.
- .8 Concrete inserts.
- .9 Hydrophilic waterstop.
- .10 Aluminum expansion joint system.
- .7 Shop Drawings
 - .1 Submit shop drawings of accessories where required in accordance with Section 01300 indicating where used and how accessories are to be placed and as specified below. Copies of portions or all of the structural drawings will not be accepted as shop drawings.
 - .2 Clearly indicate all pertinent dimensioning, arrangements and locations of concrete accessories.
 - .3 Master Plan(s) of Concrete Placements
 - .1 Before submitting shop drawings of formwork, falsework and reinforcing bars, submit master plan(s) showing separate concrete placements and locations of construction joints, including proposed construction joints in addition to those indicated on Drawings.
 - .4 Expansion and Construction Joints
 - .1 Submit shop drawings of joints.
 - .2 For each expansion joint and construction joint with waterstop, submit an elevation or section taken through the plane of the joint showing the walls and slabs at the joint. Show details of waterstops, sizes, types, and splices at intersections. Submit details of method securing waterstops in place, other details required for construction of a watertight joint, details of preformed joint fillers, joint fillers, sealants, adhesives, and other appurtenances.
 - .5 Inserts
 - .1 Submit shop drawings detailing location, size, and type of concrete inserts, and lintel anchor wedge inserts.
 - .2 Indicate shop coatings, galvanizing, or surface treatments.
 - .6 Neoprene Waterstop Expansion Joint System

Concrete Accessories

- .1 For each expansion joint containing a neoprene waterstop expansion joint system, submit an elevation or section taken through the plane of the joint showing the walls and slabs at the joint. Show details of waterstop system, sizes, types, and splices at intersections. Submit details of method of securing waterstop system in place, and all details required for construction of a watertight joint.
- .7 Aluminum Expansion Joint System
 - .1 For each expansion joint containing an aluminum expansion joint system, submit an elevation or section taken through the plane of the joint showing the walls and slabs at the joint. Show details of system including material, sizes, types and splices at intersections. Submit details of method of securing expansion joint system in place, and all details for construction of a watertight joint.
- .8 Prior to submission to Consultant, Contractor shall review all shop drawings. By this review, Contractor represents to have determined and verified all field data, and to have checked and coordinated each shop drawing with requirements of Work and of Contract Documents. Contractor's review of each shop drawing shall be indicated by stamp, date and signature of the Contractor's representative.
- .9 At time of submission, Contractor shall notify Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.
- .10 Consultant will review and return shop drawings in accordance with an agreed schedule. Consultant's review is intended as an assistance to the Contractor and will be for conformity to design concept and for general arrangement, and shall not relieve the Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of Contract Documents.
- .11 Contractor shall make changes in shop drawings, which Consultant may require, consistent with Contract Documents and resubmit unless otherwise directed by Consultant. When resubmitting, Contractor shall notify Consultant in writing of revisions other than those requested by Consultant.
- .12 Fabrication and construction that commences prior to shop drawing review by the Consultant is at the Contractor's risk.
- .13 Submit shop drawings as follows:
 - 1 copy for review before any Work commences.
 - 1 additional copy of shop and erection drawings for distribution as directed by Consultant.
 - 1 copy of reviewed shop and erection diagrams to Inspection and Testing Company.

1.5 Sample Panels

- .1 Provide concrete accessories for placement in a sample formwork panel for each architectural concrete surface receiving special treatment, painted finish or exposed finish as a result of formwork. Construct 2400 x 2400 in size to fully

Concrete Accessories

indicate special treatment or finish required, and include V-joints, reglets, cone ties and tie pattern and other patterns detailed.

- .2 Approved sample concrete panels shall be considered basis of quality for accessory work. Locate where directed.

1.6 Delivery, Storage and Handling

- .1 Deliver concrete accessories supplied under Work of this Section to those responsible for their installation, to location they direct, and to meet construction schedule.
- .2 Exercise care in storing and handling materials of this Section. Handle and store concrete accessories so that no damage, contamination or corrosion is caused to stored or erected Work, or to other property.
- .3 Co-ordinate Work of this Section with Work specified in other Sections, and arrange to deliver and concrete accessories in accordance with construction schedule.

1.7 Quality Control

- .1 Contractor is not to assign responsibility of coordination of concrete accessories and placing required material. Ensure a full-time qualified superintendent representing Contractor is in attendance to inspect and check all phases of this Work.

1.8 Inspection and Testing of Drilled Anchors

- .1 Test drilled anchors by a testing firm certified in accordance with CSA-A283, retained and paid for by the Owner and approved by Consultant in accordance with Section 01 40 00 of these specifications.
- .2 Provide casual labour to testing firm's field personnel for purpose of obtaining and handling sample materials. Provide free access to all portions of Work, and cooperate with testing firm.
- .3 Test anchors to 150% of the tension working load noted on Drawings or by manufacturer's rated allowable tensile load.
- .4 Minimum testing:

For 500 anchors or more, test 5% of anchors
For 100 to 499 anchors, test 7% of anchors
For 50 to 99 anchors, test 10% of anchors
For 20 to 49 anchors, test 14% of anchors
For 10 to 19 anchors, test 20% of anchors
For 1 to 9 anchors, test 33% of anchors.
- .5 Additional testing, paid for by the Contractor, will be required if failures occur.

PART 2 - PRODUCTS

Unit Prices

Concrete Accessories

- .1 Unit prices requested as a part of the Tender shall include Work erected in place, and preparation and submittal of necessary shop and erection drawings.
- .2 Unit prices to be applied to the net area difference.

Materials

- .1 Generally in accordance with Reference Standards.
- .2 Concrete accessories brought on site shall be new.
- .3 Concrete Form Accessories:
 - .1 Vapour barrier and accessories:
 - .1 Plastic vapour barrier:
:Perminator 15 mil by W.R. Meadows.
:Stego-Wrap 15 mil by Stego Industries.
 - .2 Seam Tape
:High Density Polyethylene Tape with pressure sensitive adhesive.
Minimum width 100 mm (4").
 - .3 Pipe Boots
:Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.
 - .4 Bituminous Vapour Barrier/Water Proofing Membrane
:Premoulded Membrane Vapor Seal with Plasmatic Core by W.R. Meadows.
 - .5 Bonding Asphalt: Catalytic Bonding Asphalt.
 - .6 Adhesive: PM-5X.
 - .7 Joint Tape: PMPC Tape.
 - .8 Pointing Mastic: Pointing Mastic.
 - .2 Lintel and Shelf Angle Anchors: hot-dipped galvanized, built-in, adjustable, with askew head bolts, washers and nuts.
 - .1 Peerless Wedge Adjustable Anchor Slot by NCA/Acrow Richmond.
 - .3 Dovetail anchor slots: Minimum 1.6 mm (1/16") thick galvanized, glass fibre filled.
 - .4 Galvanized metal key joint: Thickness 0.60 mm (0.025") sized to suit slab on grade thickness for construction and control joints.
 - .5 Expansion joints: Eva-Cap or approved equal.

Concrete Accessories

- .4 Waterstop Accessories
 - .1 PVC Waterstop to CGSB 41-GP-35M, types 2 and 3. Purpose made, minimum 14 MPa tensile strength, -50°C to 80°C working temperature rating.
 - .1 Construction Joints, Internal Waterstop.
150 mm (6") wide, ribbed, tapered thickness varying from 9.5 mm (3/8") minimum near centre to 6.4 mm (1/4") minimum near edge.
:Wirestop PVC Waterstop type FR-6380, with steel wire fastening loops, by DRE Industries Inc., Etobicoke, Ontario.
:Vinylex PVC Waterstop type RB6-38, by Dayton Superior Canada Ltd., Rexdale, Ontario.
:Epseal PVC Waterstop type 6380, by W.R. Meadows of Canada Ltd.
:CPD Type 5.
:Greenstreak Style 732.
:Vinylex Corp. No. RB6-38H.
 - .2 Construction Joints, External Waterstop.
240 mm (9.5") wide by 4.5 mm (0.18") thick.
:Vinylex PVC Waterstop type RS-532, by Dayton Superior Canada Ltd., Rexdale, Ontario.
:CPD Type 61.
:Vinylex Corp. No. BS9-532.
:Greenstreak Style 937.
 - .3 Expansion Joints, Internal Waterstop.
229 mm (9") wide, ribbed, with centre bulb; tapered thickness varying from 9.5 mm (3/8") minimum near centre, to 6.4 mm (1/4") minimum near edge, with 20 mm (3/4") inside diameter centre bulb.
:Wirestop PVC Waterstop type CR-9380, with steel wire fastening loops, by DRE Industries Inc., Etobicoke, Ontario.
:Vinylex PVC Waterstop type RLB-38, by Dayton Superior Canada Ltd., Rexdale, Ontario.
:Sternseal PVC Waterstop type 7c, by The Sternson Group, Brantford, Ontario.
:Epseal PVC Waterstop, type no. 9380G, by W.R. Meadows of Canada Ltd.
:CPD Type 7C.
:Greenstreak Style 738.
:Vinylex Corp. No. RB9-38.
 - .4 Expansion Joints, Exterior Waterstop.
240 mm wide.
:CPD Type 62
:Vinylex Corp. No. BSE9-532.
:Greenstreak Style 938.
 - .5 Neoprene Waterstop Expansion Joint System:
 - .1 Jeene Structural Sealing Joint System supplied by Watson Bowman Acme Limited.
 - .6 Hydrophilic Waterstop:

Concrete Accessories

- .1 Adela Ultra Seal MC-2010M as manufactured by Asahi Denka Kogyo K.K.
- .5 Copper Strip:
 - 0.549 mm (16 oz.) thick cold rolled, to ASTM B152. The following supply flat stock copper sheet.
 - :Roy Metal Sales, Concord, Ontario
 - :Drummond McCall, Hamilton, Ontario
- .6 Stainless Steel Strip:
 - 0.91 mm (20 ga) thick stainless steel, grade 304
 - :National Concrete Accessories (Acrow-Richmond), Rexdale, Ontario.
- .7 Aluminum Expansion Joint:
 - :BI-25 Aluminum Expansion Joint system with natural rubber seals and epoxy injection hose system as per MTO Std. Dwgs. SS113 and SS113-12 as manufactured by A.J. Braun Manufacturing Ltd., Kitchener, Ontario.
- .8 Expansion Joint Filler and Isolation Joint Filler:
 - .1 Bituminous Type:
 - Premoulded, resilient, non-extruding, asphalt impregnated fibre, to ASTM D1751.
 - .2 Non-Bituminous Type:
 - Premoulded, resilient, non-extruding, to ASTM 1752, and compatible with polysulphide urethane, polyepoxide urethane, or neoprene sealants, as applicable.
- .9 Bonding Agents
 - .1 Bonding agent:
 - .1 Latex emulsion.
 - .2 Bonding agent: High polymer resin emulsion mixed with cement, mortar or grout to form a water resistant adhesive bond.
 - .3 Concrete Curing, Sealing Compounds and Hardener Accessories
 - .4 Floor Hardener:
 - .1 Metallic Hardener: Ferrous aggregate premixed with Portland cement and plasticizers.
 - :Ferroplate, by SIKA Canada Ltd.
 - :Masterplate 200, by Master Builders Ltd.

Concrete Accessories

- .2 Non-Metallic Hardener: Natural and synthetic materials with Mohs hardness 7 minimum, premixed with Portland cement.

:Durag Premium, by SIKA Canada Ltd.
:Mastercron, by Master Builders Ltd.
- .11 Sandblasting Accessories
 - .1 Sandblast sand: Fine granular material, hard, strong durable mineral particles conforming to CSA-A179-94.
 - .2 Sandblast equipment: Capable of delivering 5.6 m³ (200 cft) of free air at 0.69 MPa pressure, complete with filters, hoses and nozzles that can be regulated to ensure an even finish as approved by Consultant.
- .12 Sealers
 - .1 Penetrating silane sealer:

:Hydrozo Enviroseal 20, by Harris Specialty Chemicals Inc., Burlington, Ontario.
:SM Deck Seal, by Canadian Barrier Ltd., Carp, Ontario.
:Saltguard 12%, by Construction Products Distribution Services, Concord, Ontario.
:Stifel S, by Dayton Superior Ltd., Rexdale, Ontario.
:Hydrozo Silane 40 IPA, by Harris Specialty Chemicals Inc., Burlington, Ontario
:Masterseal SL 40, by Master Builders.
:Cappar Capseal U.
 - .2 Pigmented sealer:

:Cappar concrete sealer Capseal A50.
:Acrytite by Sternson.

Colour to be determined by Consultant.
- .13 Sealants:
 - .1 Hot-Poured Asphalt:

For use with bituminous type joint filler: rubberized asphalt compound, to OPSS 1212.
:Hi-Spec Hot Poured Joint Sealant, by W.R. Meadows of Canada Ltd.
:Sealz No. 6165 Hot Poured Joint Sealant, by Hydrotech Membrane Corporation.
 - .2 Cold Poured Liquid Neoprene:

For use with non-bituminous joint filler.
:Gardox, by W.R. Meadows of Canada Limited.

Concrete Accessories

- .3 Elastomeric Sealant:
 - For use with non-bituminous type joint filler.
 - .1 Two component polysulphide, or two component polyepoxide urethane, in colour selected by Consultant, to CGSB Specification CAN/CGSB-19.24.
 - :For horizontal joints: THC 900, by Tremco Ltd.
 - :For vertical joints: Dymeric, by Tremco Ltd.
 - .2 Or one part urethane, in colour selected by Consultant, to CAN/CGSB-19.13.
- .4 Sealant in Conjunction with Dampproofing:
 - :Plastic cutback asphalt to CAN/CGSB-37.5.
- .14 Control Joint Filler:
 - .1 For control joints in interior floors, approved semi-rigid joint filler, to protect against slab edge breakdown:
 - .1 For sawcuts made with "Soff-Cut®" saw:
 - :Loadflex SC Plus, by SIKA Canada Ltd.
 - :Euco 700, by The Euclid Chemical Company, Rexdale, Ontario.
 - .2 For other sawcuts and joints:
 - :Loadflex, by SIKA Canada Ltd.
 - .2 For control joints in exterior floors left exposed.
 - :Elastomeric sealant as specified in above subparagraph 2.2.13.3.
- .15 Dampproofing:
 - .1 For use in temperatures above 5°C (40°F).
 - :Mineral colloid asphalt emulsion, to CAN/CGSB-37.2.
 - .2 For use in temperatures 5°C (40°F) and below
 - :Asphalt cutback, unfilled, to meet CGSB 37-GP-6Ma.
- .16 Non-Slip Inserts:
 - Fine aluminum oxide, standard strips, 6 mm (¼") wide, 10 mm (3/8") deep.
- .17 Curing Blanket:
 - Amoco Propex #4551, white colour, by Amoco Propex, Hawkesbury, Ontario.

Concrete Accessories

- .18 Tie Hole Plugs
 - .1 Precast concrete plugs: To fit cone holes formed by compatible form ties. Colour and texture to match surrounding concrete.
- .19 Concrete Inserts
 - .1 Concrete inserts: Inserts with plastic setting plugs by NCA/Acrow-Richmond Ltd., or Dayton Superior Canada Limited.
 - .2 Structural connection inserts: Inserts with plastic setting plugs; LF-W by NCA/Acrow-Richmond Ltd., or F-42 by Dayton Superior Canada Limited.
 - .3 Loop ferrule inserts: Inserts with plastic setting plugs; SLFW by NCA/Acrow-Richmond Ltd., for F-42 by Dayton Superior Canada Limited.
 - .4 Lifting eye bolt: LEB by NCA/Acrow-Richmond Ltd., or F-49 by Dayton Superior Canada Limited.

PART 3 - EXECUTION

3.1 General

- .1 Perform concrete accessories Work in accordance with requirements of CSA-A23.1 unless indicated otherwise on Drawings.

.1 Examination

- .1 Verify and approve alignment and levels of supporting members before laying roof deck. Do not proceed with erection until conditions are made satisfactory.

.2 Erection

- .1 Notify Consultant and Inspection and Testing Company a minimum of 24 hours prior to installing concrete accessories to allow for inspection.

3.4 Formwork Erection

- .1 Ensure that supplied accessories, hardware, and items to be cast-in will fit concrete dimensions.
- .2 Ensure concrete surfaces of construction joints are properly prepared for application of bonding agents prior to placing fresh concrete.
- .3 Provide continuous waterstop at all construction joints in water retaining structures and structures with high ground water level to 1000 mm (36") above the water level and not less than locations noted on Drawings.

Concrete Accessories

3.5 Forming of Architectural and Exposed Concrete

- .1 The intent of this Section is to ensure the accessories for formwork are of a high quality resulting in concrete surfaces free of unsightly cold joints, blemishes, bugholes, honeycombing and cracking.
- .2 Allow Consultant to inspect and approve accessories placed in formwork prior to placing concrete.
- .3 Ensure that horizontal and vertical reglets to be placed in formwork are acceptable for joint sealants.
- .4 Ensure that V-joints and reglets in forms at all vertical and horizontal placement breaks are acceptable for joint sealants.
- .5 Fill exterior V-joints and reglets in walls below grade or where waterproofing is specified with an approved cementitious waterproofing or other approved waterproofing material.

3.6 Concrete Accessories

- .1 Install concrete accessories in accordance with Drawings and manufacturer's recommendations, straight, level and plumb. Ensure adequate support to prevent movement during concrete placement.
- .2 Install concrete inserts with plastic setting plugs.
- .3 Install waterstops continuous without displacing reinforcement. Do not nail through waterstops. Heat seal joints watertight.
- .4 Wire waterstop to reinforcing to prevent folding during concrete placement.
- .5 Self Angle Anchors: Install anchors as indicated on Drawings and shop drawings, and tighten nuts and bolts at each anchor.
- .6 Dovetail Anchor Slots:
 - .3 Build in dovetail anchor slots for masonry anchors in locations directed by mason.
 - .4 Install dovetail anchor slots for full height of vertical concrete surfaces faced with masonry that exceed a height of 400 mm (16") and that are not waterproofed.
 - .5 Install slots continuous and vertical at 600 mm (24") centres maximum, with at least one slot at each surface 600 mm (24") or less in width.

3.7 Construction and Expansion Joints

- .1 PVC Waterstops in Construction and Joints
 - .1 Provide continuous waterstop at construction joints in water retaining structures and structures with high ground water level to 1000 mm (36") above the water level and not less than locations noted on Drawings.

Concrete Accessories

- .2 Provide and install internal PVC waterstops specified in paragraph 2.2.4.1.1 at construction joints in walls which retain earth, and in construction joints in tunnel slabs.
- .3 struction joints in walls which retain earth, and in construction joints in tunnel slabs.
- .4 Provide and install external PVC waterstops specified in paragraph 2.2.4.1.2 at below grade construction joints, on earth face of walls which retain earth.
- .5 Use prefabricated factory-made sections at junctions (at "L", "T", "cross" & "transition" joints), for both flat and vertical junctions as applicable, to form a continuous unbroken seal.
- .6 Place waterstops with equal embedment each side of joint.
- .7 Join waterstops in floors to waterstops in walls.
- .8 Heat seal joints in PVC waterstops to make watertight, using mitred joints, in accordance with manufacturer's instructions.
- .9 Do not displace reinforcement when installing waterstops.
- .10 Tie edges to adjacent reinforcing bars to prevent displacement during concrete placement.
- .11 Hydrophilic Waterstops in Construction Joints
- .12 Install waterstops in strict accordance with manufacturer's printed specifications and recommendations.
- .13 Installation shall not proceed when work areas are flooded to the extent that would cause hydrophilic waterstop to hydrate; nor when precipitation can be responsibly anticipated before hydrophilic waterstop can be properly installed or protected.
- .14 Clean all debris, dirt and rocks from dry concrete surface. Concrete to be free of large voids and projections.
- .15 Apply adhesive, 3M-2141 bonding agent to prepared concrete surface and allow to set approximately 15 minutes or until tacky.
- .16 Press the entire length of hydrophilic waterstop firmly against primed surface. Verify a minimum of 50 mm (2") of concrete coverage will be maintained over entire placement of waterstop. Place in maximum practicable lengths to minimize coil and joints.
- .17 Overlap ends a minimum 50 mm (2") when joining.
- .18 When working with wet concrete, nail hydrophilic waterstop in place using concrete nails placed 250-300 mm (10"-12") apart.

Concrete Accessories

- .19 Pour and vibrate concrete. Whenever possible do not pour concrete directly on waterstop or allow vibrator to come in direct contact with waterstop.
- .20 Provide and install waterstops at construction joints as indicated on Drawings.
- .21 Construction Joints at Junction of Old and New Work:
- .22 Install continuous copper strip (flat sheet material specified in paragraph 0.5) waterstop, for full length of joint between old and new construction, shaped as detailed on Drawings, and with joints lapped and soldered to be watertight.
- .23 Cut dovetail chase to receive strip in existing structure with carborundum wheel.
- .24 Embed strip in chase with solidly packed metallic or chemical waterproofing grout.
- .25 Expansion Joints
- .26 PVC Waterstops in Expansion Joints
- .27 Provide and install PVC waterstops with centre bulb specified in paragraph 0.4.4.3, in expansion joints in foundation walls, walls retaining earth, and floor framing.
- .28 Use prefabricated factory-made sections at junctions (at "L", "T", "cross" & "transition" joints), for both flat and vertical junctions as applicable.
- .29 Place waterstops with equal embedment each side of joint.
- .30 Join waterstops in floors to waterstops in walls.
- .31 Heat seal joints in PVC waterstops to make watertight, using mitred joints, in accordance with manufacturer's instructions.
- .32 Tie edges to adjacent reinforcing bars to prevent displacement during concrete placement.
- .33 Fill joints at each side of waterstop with premoulded expansion joint filler specified in paragraph 0.8. For joints to be caulked, stop joint filler 45 mm (1.75") back of concrete face, to allow for backer rod and sealant.
- .34 Install and anchor expansion joint hardware supplied under Work of this Section.
- .35 Expansion Joints at Junctions of Old and New Work
- .36 Install continuous copper strip (flat sheet material specified in paragraph 0.5) waterstop, for full length of joints between old and new construction, shaped as detailed on Drawings, and with joints lapped and soldered to be watertight.
- .37 Cut dovetail chase to receive strip in existing structure with carborundum wheel.

Concrete Accessories

- .38 Embed strip in chase with solidly packed metallic or chemical waterproofing grout.
- .39 Install finish hardware as detailed on Drawings.
- .40 Provision for Future Extension:
- .41 Install continuous PVC waterstop with centre bulb, for full length of junction between new and future construction, and heat seal joints to make watertight.
- .42 Provide protection boxes, hardware, and fasteners as required to protect end of waterstop at expansion and construction joints for future expansion.
- .43 Slab-on-Grade Isolation Joints:
- .44 Install 12 mm (½") thick premoulded joint filler specified in paragraph 0.8, around perimeter of slabs-on-grade at junction of vertical surfaces, equipment bases and where indicated on Drawings.
- .45 Install joint filler for full depth of slabs.
- .46 Install joint filler to within 28 mm (1.125") of top of slab where sealant is indicated.
- .47 Preformed Joint Fillers
- .48 Affix self-expanding cork to face of concrete immediately prior to second placement. Remove coatings and debris. Keep cork dry to prevent premature expansion of cork.
- .49 Provide foamed PVC joint filler in dry areas.
- .50 Horizontal Expansion Joints
- .51 Seal top of horizontal expansion joints of liquid holding structures with sealant. Remove spills or overflows.
- .52 Neoprene Waterstop Expansion Joint System
- .53 Provide at locations shown on Drawings.
- .54 Assemble intersections, splice, and install waterstop in accordance with manufacturer's printed instructions.
- .55 Aluminum Expansion Joint System
- .56 Provide at locations shown on Drawings.
- .57 Install system in accordance with manufacturer's shop drawings and printed instructions.
- .58 Epoxy injection as per manufacturer's instructions.

Concrete Accessories

- .59 Neoprene Compression Seal System
- .60 Provide at locations shown on Drawings.
- .61 Assemble intersections, splice and install compression seal in accordance with manufacturer's printed instructions.

3.8 Placing Concrete

- .1 Ensure accessories and hardware and other items to be cast into concrete are placed securely and will not cause undue hardship in placing concrete.
- .2 Ensure accessories and hardware, inserts, embedded parts, formed expansion and contraction joints and other critical items are not disturbed during concrete placement.
- .3 Ensure waterstop is securely wired to reinforcing to prevent folding or movement during concrete placement. Maintaining the integrity and correct position of waterstop is critical to the performance of the structure.

3.9 Vapour Barrier

- .1 Refer to drawing design notes for extent of vapour barrier.
- .2 Place vapour barrier on prepared subgrade under slabs on grade.
- .3 Installation shall be in accordance with manufacturer's instructions and ASTM E1643-98.
- .4 Unroll vapour barrier with longest dimension parallel with direction of pour.
- .5 Lap vapour barrier over footings and seal to foundation walls.
- .6 Overlap joints 150 mm (6"), apply bead of mastic and seal with manufacturer's tape.
- .7 Seal all penetrations (including pipes) with manufacturer's pipe boot.
- .8 No penetration of vapour barrier is allowed except for reinforcing steel and permanent utilities.
- .9 Repair damaged areas by cutting patches of vapour barrier, overlapping damaged area 150 mm (6") and taping all four sides with tape.
- .10 Apply membrane in accordance with manufacturer's instructions to provide a permanent, monolithic vapour seal without voids or open seams.
- .11 Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.
- .12 Place membrane in position by either Dutch lap method with laps sealed with bonding asphalt or by butt joint method with joints sealed with joint tape.
- .13 Point exposed edges with pointing mastic to prevent water from travelling under membrane.

Concrete Accessories

- .14 Place membrane collar around protrusions through concrete slab, including sewer pipes, water pipes, and utility inlets to create a positive seal between protrusions and membrane. Seal in place with joint tape and point around protrusions with pointing mastic.
- .15 Adhere membrane to vertical surfaces with adhesive.

3.10 Field Quality Control

- .1 Inspection and Testing Company, when appointed as specified in Source Quality Control elsewhere in this Section, shall perform:
 - .1 Verification of material properties.
 - .2 Verification that erection and fastening comply with Contract Documents.
 - .3 General inspection of coating touch-up.

3.11 Cleaning

- .1 Repair, remove and clean drips and smears resulting from Work of this Section on exposed, finished surfaces or surfaces to be subsequently finished.
- .2 Hose down sandblasted surfaces. Brush thoroughly with stiff broom to remove dust and loose particles.

3.12 Defective Work

- .1 Variations in excess of specified tolerances and failure of materials or workmanship to meet requirements of this specification will be considered defective Work performed by this Section.
- .2 Replace defective Work, as directed by Consultant.
- .3 Replace damaged accessories where exposed to view.
- .4 Contractor shall pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work is deficient or fails to meet the shop or fieldwork drawing details. Costs for additional inspection, testing, review and redesign to be deducted from Contract Value.

END OF SECTION

Concrete Reinforcement

PART 1 - GENERAL

1.1 General Requirements

- .1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.
- .2 Quantities and dimensions enclosed in brackets apply to Project for which Drawings are in imperial units.
- .3 Obtain a copy of CSA Standard A23.1, and maintain on site.

1.2 Description

- .1 Sections which Specify Reinforcement Installed in Compliance with This Section.
 - .1 Excavated Caissons Section 31 63 23
 - .2 Concrete Sidewalks and Curbs Section 32 13 15
- .2 Related Work Specified in Other Sections
 - .1 Submittals and Shop Drawings Section 01 30 00
 - .2 Quality Control Section 01 40 00
 - .3 Excavation and Backfill Section 31 23 10
 - .4 Concrete Formwork Section 03 10 00
 - .5 Concrete Accessories Section 03 15 00
 - .6 Cast-In-Place Concrete Section 03 30 00
 - .7 Concrete Floor Finishes Section 03 35 00
 - .8 Grout Section 03 37 00
- .9 Equipment bases, exterior catch basins and manholes
and similar Work specified for inclusion under mechanical and electrical Work.
Division 21, 22, 23, 26, 27 & 28
- .3 Work Installed but Supplied under Other Sections
 - .1 Install materials specified to be supplied under other Sections of these project Specifications. Materials include but are not limited to:
 - .2 Ensure installation is to satisfaction of trades concerned and of Consultant prior to placing concrete.
- .4 Cooperation with Work of Other Sections:
 - .1 Check project Drawings and Specifications for requirements of other Sections, which will affect installation of Work of this Section.

Concrete Reinforcement

- .5 Cooperation with Consultant:
 - .1 Before commencing Work, review with Consultant, Work performed under this Section.
 - .2 Schedule Work to allow sufficient time and access for Consultant to carry out periodic field review.
- .6 Cooperation with Inspection and Testing Company:
 - .1 Provide free access to Work.

1.3 Quality Assurance

- .1 Reference Standards and Publications:
 - .1 All standards to be latest issue at time of tender.
 - .2 Provide one copy on site of the first three standards listed below.
 - .3 The following reference standards shall govern Work of this Section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following Standards apply but are not necessarily repeated in following list:
 - .1 2012 OBC "Ontario Building Code".
 - .2 CSA-A23.1-19, "Concrete Materials and Methods of Concrete Construction".
 - .3 CSA-A23.3-19, "Design of Concrete Structures for Buildings".
 - .4 CAN/CSA-G30.18-21, "Carbon Steel Bars for Concrete Reinforcement".
 - .5 CAN/CSA-G164-18, "Hot Dip Galvanizing of Irregularly-Shaped Articles".
 - .6 CSA-W186-21, "Welding of Reinforcing Bars in Reinforced Concrete Construction".
 - .7 ASTM D3963/D3963M-21, "Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars".
 - .8 American Society for Testing and Materials (ASTM) where noted.
 - .9 American Concrete Institute Detailing Manual (ACI 315-18) where noted.
 - .10 Concrete Reinforcing Steel Institute (CRSI) where noted.
 - .11 Reinforcing Steel Institute of Canada (RISC), "Manual of Standard Practice, Metric Supplement" where noted.
 - .12 Provincial safety standards where applicable.

Concrete Reinforcement

- .2 Regulations
 - .1 Abide by current bylaws and regulations of province and/or municipality in which Work is located, and abide by current laws and regulations with regard to public safety.
 - .2 Regulations of the Minister of Labour, Occupational Health and Safety Act, the Workers' Compensation Board and other applicable acts administered by the authority having jurisdiction of the province apply to Work of this Section.
- .3 Safety
 - .1 Carry out concrete reinforcement Work in accordance with Ontario Building Code and current Occupational Health and Safety Act construction safety regulations.
- .4 Qualifications
 - .1 The applicator for epoxy-coating of reinforcing steel shall be certified under CRSI Voluntary Certification Program for Fusion Bonded Epoxy Coating Applicator Plants.
 - .2 Undertake welding of reinforcement only by fabricator or Subcontractor approved by Canadian Welding Bureau to requirements of CSA Standard W186.
- .5 Source Quality Control:
 - .1 Inspection and testing materials and fabrication of Work of this Section, and field quality control specified elsewhere in this Section, may be performed by an Inspection and Testing Company appointed by Consultant.
 - .2 Review provided by Inspection and Testing Company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of this specification.
 - .3 Identify and correlate reinforcing steel from Canadian mills with test reports for compliance with requirements specified.
 - .4 Test unidentified reinforcing steel at expense of Contractor. Perform testing for each 1 tonne (ton) or part thereof supplied for incorporation in Work.
 - .5 Payment for specified work performed by Inspection and Testing Company will be made by Owner.
 - .6 Provide access for inspection to all places where Work is manufactured, stockpiled or installed.

1.4 Submittals

- .1 General
 - .1 Submit copies of mill certificate test reports of reinforcement if requested by Consultant.

Concrete Reinforcement

- .2 Submit results of ladle analysis of all reinforcement to be spliced by welding, and submit manufacturer's information and test reports for mechanical splices of all reinforcement to be mechanically spliced.
 - .3 Submit proof that applicator of epoxy coating is certified by the manufacturer and that the applicator is certified under the CRSI Voluntary Certification Program for Fusion-Bonded Epoxy Coating Applicator Plants.
 - .4 Submit responses to site review reports stating that all reported defects and deficiency items were corrected or stating what action was taken.
- .2 Shop Drawings
- .1 Submit shop drawings, including placing drawings and bar lists, in accordance with Section 01 30 00 and as specified below. Copies of portions or all of the structural drawings will not be accepted as shop drawings.
 - .2 Prepare placing drawings and bar lists in accordance with the American Concrete Institute (ACI) Detailing Manual, the Reinforcing Steel Institute of Canada (RSI) Reinforcing Steel Manual of Standard Practice, and the typical details included with Contract documents.
 - .3 Prepared placing drawings to minimum scale of 1:50 ($\frac{1}{4}" = 1'-0"$).
 - .4 Submit placing drawings and bar lists sufficiently detailed and dimensioned to permit correct placement of reinforcement and accessories without reference to the architectural or structural Drawings.
 - .5 Clearly indicate bar sizes, bending and cut lengths, spacings, locations and quantities of reinforcing steel and wire fabric. Submit bending and cutting schedules and supporting and spacing devices.
 - .6 Use large scale details for areas of congested reinforcement.
 - .7 Show reinforcement, including dowels, in elevation on placing drawings for wall reinforcement.
 - .8 Show concrete cover to reinforcement.
 - .9 Show location of construction joints.
 - .10 Indicate type of chair where concrete is exposed to view, in accordance with paragraph 2.2.2.6.
 - .11 Prior to submission to Consultant, Contractor shall review all shop drawings. By this review, Contractor represents to have determined and verified all field data, and to have checked and coordinated each shop drawing with requirements of Work and of Contract documents. Contractor's review of each shop drawing shall be indicated by stamp, date and signature of the Contractor's representative.
 - .12 At time of submission, Contractor shall notify Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.

Concrete Reinforcement

- .13 Consultant will review and return shop drawings in accordance with an agreed schedule. Consultant's review is intended as an assistance to the Contractor and will be for conformity to design concept and for general arrangement, and shall not relieve the Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of Contract Documents.
- .14 Contractor shall make changes in shop drawings, which Consultant may require, consistent with Contract Documents and resubmit unless otherwise directed by Consultant. When resubmitting, Contractor shall notify Consultant in writing of revisions other than those requested by Consultant.
- .15 Do not commence fabrication of reinforcement before drawings have been reviewed and Consultant's comments incorporated on drawings issued to fabricating shop. Fabrication and construction that commences prior to shop drawing review by the Consultant is at the Contractor's risk.
- .16 Submit shop drawings as follows:
 - 1 copy for review before any Work commences.
 - 1 additional copy of shop and erection drawings for distribution as directed by Consultant.
 - 1 copy of reviewed shop and erection diagrams to Inspection and Testing Company.
- .3 Samples
 - .1 Submit samples of accessories.
- .4 Inspection Reports:
 - .1 Base inspection and testing upon Contract Drawings, Specifications and reviewed shop and placing drawings bearing Stantec review stamp.
 - .2 Report immediately to Consultant, by phone, any deviations from the Contract Drawings, giving recommendations for further testing deemed necessary. No modifications to be made or instructions given without prior approval of Consultant.
 - .3 Submit reports at least weekly when shop and site Work of this Section is in progress. At beginning of each report, state whether Contract Requirements have been met and list separately conditions not meeting requirements.
 - .4 Distribute inspection reports as follows:
 - 1 copies to Consultant.
 - 1 copy to Consulting Structural Engineer.
 - 1 copies to Contractor.
 - .5 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.
 - .6 Include an ongoing deficiency list of outstanding items from previous reports; indicate date of first observation, comment on status and date of corrective action, and comment on status.

Concrete Reinforcement

- .7 Issue final report at end of the applicable phases of Work signifying that Work is in overall conformity with Contract Documents and reviewed shop drawings.

1.5 Delivery, Storage and Handling

- .1 Deliver materials to site in bundles easily identified and properly marked.
- .2 Store and handle material on site in a manner to prevent damage and contamination.
- .3 Do not straighten or re-bend any reinforcement.
- .4 Do not use any reinforcement that has been kinked or bent on site.
- .5 Epoxy-Coated Bars:
 - .1 Protect epoxy-coated bars, with a suitable covering on drive rolls on shear beds, and back-up barrels on benders.
 - .2 Do not drop or drag bars.
 - .3 Use only systems with padded contact areas.
 - .4 Lift bar bundles with strong back, spreader bar, multiple pick up points or supports, or platform bridge, to prevent bar to bar abrasion from sags.
 - .5 Use nylon slings or padded wire rope slings.
 - .6 Store above ground on wooden or padded supports or other non-abrasive cribbing to prevent sagging.
 - .7 Do not place other materials on top of stored bars.
 - .8 Store away from long-term direct sunlight.
 - .9 Cover as required.

1.6 Quality Control

- .1 Contractor shall not assign responsibility of coordination of placing reinforcing steel and placing other required material. Ensure a full-time qualified superintendent representing the Contractor is in attendance to inspect and check all phases of this Work.

1.7 Inspection and Testing of Reinforcement

- .1 Provide casual labour to testing firm's field personnel for purpose of obtaining and handling sample materials. Provide free access to all portions of Work, and cooperate with testing firm.
- .2 Provide samples of reinforcement and epoxy coated reinforcement as delivered to site. State that epoxy coating meets specified standards and manufacturer's requirements.
- .3 Testing firm shall take at least one tension test and one bend test for each bar size for each batch of 5 tonnes or less in accordance with CAN/CSA-G30.18.

Concrete Reinforcement

- .4 Testing firm is to test 10% of all specified reinforcement products.
- .5 Testing firm to certify, in writing, that reinforcement meets the specified requirements.

1.8 Payment

- .1 Payment for Work of this Section shall be on a lump sum basis as tendered which shall be full compensation for all labour, materials, and equipment necessary to complete the Work, including all subsidiary and incidental items thereto for which separate payment is not elsewhere provided.

1.9 Alternative Prices

PART 2 - PRODUCTS

2.1 Unit Prices

- .1 Unit prices requested as a part of the Tender shall include detailing, materials, bending, placing and cleaning.
- .2 Unit prices to be applied to the net area difference.

2.2 Materials

- .1 Generally:
 - .1 In accordance with Reference Standards.
- .2 Bar Reinforcing Steel:
 - .1 Bar areas are 100 mm², 200 mm², 300 mm², 500 mm², 700 mm², 1,000 mm², 1,500 mm², and 2,500 mm² for bar designations 10M, 15M, 20M, 25M, 30M, 35M, 45M and 55M respectively. Be aware that some sources produce bars of same designation but with significantly smaller areas, and such bars shall not be used without written permission of Consultant and appropriate adjustments in number of bars.
 - .2 Reinforcing steel: To CAN/CSA-G30.18, 400 MPa yield grade deformed billet steel bars.
 - .3 Reinforcing steel to be welded with short bending radii: To CAN/CSA-G30.18, 400W MPa yield grade special low alloy deformed billet steel for welding. The equivalent carbon content is not to exceed 0.5. Grade 400W is also to be used where the bending radius is smaller than recommended standards.
 - .4 Welded steel wire fabric: To CSA-G30.5, flat sheets, not rolls.
 - .5 Welded deformed steel wire fabric: To CSA-G30.15, flat sheets, not rolls.
 - .6 Chairs, bolsters, bar supports, spacers: Adequate for strength and support of reinforcing. Where concrete is exposed to view, exposed to elements or where rust is possible; use plastic, plastic-tipped or non-corrosive material, or precast concrete made from concrete of equal strength and durability of concrete to be

Concrete Reinforcement

- placed. Chairs used shall not result in voids or unacceptable appearance in exposed concrete surfaces.
- .7 Slab on grade chairs and bar supports: Precast concrete, plastic chairs, or subject to approval concrete masonry block or brick of correct height. Metal pipe, stone or wood are not acceptable.
- .8 Tie wire: Minimum 1.6 mm (1/16") annealed type or patented system approved by Consultant.
- .9 High strength reinforcing bar: Deformed, threaded type high strength reinforcing bar with an ultimate strength of 1035 MPa, complete with nuts, couplers, plates and other required accessories.
- .10 Deformed threaded normal strength reinforcing bars: To ASTM A615 with a yield strength of 517 Mpa, complete with nuts, couplers, plates and other required accessories.
- .11 Mechanical Connection Compression Splice Couplers:
- To develop 125 percent of yield strength of bar in compression and concentrically align bars.
:CADWELD C16 Series Compression Only splices, by Erico Inc.
:Lenton Splice, including plastic internal coupler thread protector and plastic bar end thread protector, by Erico Inc.
- .12 End Bearing Splices:
- To concentrically align bars and meet requirements of CSA Standard A23.3 Clause 12.16.6.
:PRE-SET, by Stircon Products, distributed by Harris Rebar Inc.
:SPEED SLEEVE, by Erico Inc.
- .13 Mechanical Connection Tension Splice Couplers:
- To develop 125 percent of yield strength of bar in tension.
:PortaFORGE, by Stricon Products Ltd., distributed by Harris Rebar Inc.
:Lenton Splice, including plastic internal coupler thread protector and plastic bar end thread protector, by Erico inc.
- .14 Fusion bonded epoxy-coated reinforcing steel: From Ministry of Transportation of Ontario (MTO) approved sources, in accordance with ASTM D3963/D3963M and additionally to be primed or treated with conversion coating before epoxy coating, in accordance with MTO requirements.
- .15 Supports for epoxy-coated reinforcement:
- .1 Wire bar supports shall be coated with epoxy or plastic compatible with concrete for distance of at least 50 mm from point of contact with epoxy-coated reinforcement.
- .2 Support bars and spreader bars shall be epoxy coated reinforcement.

Concrete Reinforcement

- .3 Tie wire shall be minimum 1.6 mm (1/16") annealed wire coated with epoxy, plastic or nylon.
- .16 Patching material for epoxy coated reinforcement: Use approved compatible epoxy coating material applied in strict accordance with manufacturer's instructions.
- .17 Ducts for post-tensioning: Mortar-tight galvanized corrugated metal tubes not less than 6 mm (¼") larger in internal diameter than bar to be enclosed. Provide pipes, vents, connections, grout fittings and other requirements for injection of grout after tensioning.

2.3 Fabrication of Concrete Reinforcement

- .1 Fabricate reinforcement hooks, bends, laps and similar details to CSA-A23.1, ACI Detailing Manual 315 and Metric Supplement of the Reinforcing Steel Institute of Canada (RISC) Manual of Standard Practice and in accordance with Drawings and Specifications and the reviewed shop drawings.
- .2 Fabricate reinforcing steel only in permanent fabricating shop, unless otherwise approved by Consultant.
- .3 Verify dimensions of existing Work prior to commencing fabrication.
- .4 Verify all drawing dimensions and conditions prior to commencing fabrication.
- .5 Bend reinforcement cold unless otherwise approved by Consultant.
- .6 Tag reinforcing bars to indicate placement as designated on shop drawings.
- .7 Provide padded contact surfaces for systems for handling epoxy-coated bars, to prevent damage to coating.
- .8 Provide column and wall dowels from foundations using same reinforcing as in columns and walls, unless noted otherwise on Drawings.
- .9 Provide horizontal, L-shaped corner bars with legs minimum 600 mm (24") of same cross section and spacing as horizontal bars to a maximum size of 20M or welded wire fabric around wall and grade beam corners, unless otherwise detailed on Drawings.
- .10 Provide additional support bars as required to support main reinforcement indicated.
- .11 Provide stirrup support bars sized to match stirrup size in hooks or corners of beam stirrups, unless noted otherwise on Drawings.
- .12 Provide 10M "U" spacers at 3 m (10 ft) on centre horizontally and 1.5 m (5 ft) on centre vertically to hold wall reinforcing mats in position.
- .13 Provide mesh over electrical conduit, ductwork or piping buried in slabs with strips of 102 x 102 x MW13.3 x MW13.3 welded wire fabric 300 mm (12") each side. If principal slab reinforcement is placed above conduit, then place strips under conduit. Position of reinforcing steel takes precedence over conduit, ductwork or piping.

Concrete Reinforcement

- .14 Splices:
- .1 Provide splices only where specifically indicated on Drawings.
 - .2 Locate reinforcing splices not indicated on Drawings at points of minimum stress. Location of splices shall be approved by Consultant.
 - .3 Refer to structural Drawings for minimum splices. Splices to be Class A unless noted otherwise.
 - .4 Stagger alternate mechanical splices 750 mm apart.
 - .5 Stagger alternate end bearing splices 750 mm apart.
 - .6 Install on threaded splices, plastic internal coupler thread protector and plastic bar end thread protector.
- Spec Note:** *Check that locations of tension and compression mechanical splices or end bearing splices are shown on Drawings.*
- .15 Mechanical Connection Compression Splices and End Bearing Splices in Column Reinforcement:
- .1 For column bars larger than No. 35, provide mechanical connection compression splices, or end bearing splices.
 - .2 For end bearing splices cut bearing faces of bars square, with abrasive wheel and jig to provide flat surface meeting requirements of CSA Standard A23.3 Clause 12.16.6.
- .16 Mechanical Connection Tension Splices in Column Reinforcement:
- .1 Provide mechanical tension splices where indicated on Drawings.
- .17 Weld reinforcement where indicated and only by an organization certified under requirements of CSA-W186. Do not weld reinforcing at any location without written approval of Consultant.
- .18 Test all welded reinforcement splices unless noted. Such testing to be paid for by Contractor.
- .19 Carry column reinforcing at locations noted two storeys high. If desired, Contractor may weld reinforcing with appropriate tests or use approved mechanical splices to develop full tension force.
- .20 Provide minimum reinforcing to slabs on grade unless otherwise noted: 100 mm (4") slabs 305 x 305 x MW66.7 x MW66.7 "step through" mesh. 125 mm (5") and 150 mm (6") thick slabs 305 x 305 x MW100 x MW100 "step through" mesh. An alternative using tied reinforcing steel providing the equivalent reinforcing value will be considered if approved in writing by Consultant.
- .21 Lap adjacent sheets of welded steel wire fabric to provide an overlap of at least one cross wire spacing plus 50 mm (2").
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Concrete Reinforcement

PART 3 - EXECUTION

3.1 General

- .1 Perform concrete reinforcement Work in accordance with requirements of CSA-A23.1, unless indicated otherwise on Drawings.

3.2 Examination

- .1 Examine formwork to verify that it has been completed and adequately braced in place before commencing to place reinforcement.

3.3 Placing Reinforcing Steel

- .1 Place reinforcing steel in accordance with CSA-A23.1, Clause 12, CSA-A23.3, typical details, and as indicated on Drawings.
- .2 Place reinforcement within the more stringent tolerances of sentence above and ± 6 mm ($\frac{1}{4}$ ") for slab steel and ± 12 mm ($\frac{1}{2}$ ") for other steel. Bends and end of bars to be within 50 mm of specified location. Adequately support and secure reinforcement to prevent movement within the allowable tolerances before and during placing of concrete.
- .3 Place and secure reinforcement in its correct position prior to placing concrete. Do not adjust or place reinforcement in freshly placed concrete.

Spec Note: *Engineer to make sure details have been added to drawings.*

- .4 Reinforce around openings as noted on structural Drawings.
- .5 Supply and place necessary support accessories, whether specifically detailed or not, to ensure proper placement of reinforcing steel.
- .6 Use non-corrosive or non-stain supports for reinforcing when concrete is exposed.
- .7 Support slab on grade, structural slab and pile cap reinforcement at 900 mm maximum on centre.
- .8 Supply bar support chairs for top reinforcing bars in sufficient quantity to not exceed 900 mm average spacing in each direction.
- .9 Supply chairs to support temperature reinforcing or mesh to maintain minimum covers specified.
- .10 Ensure supports are such that they are not forced into supporting formwork or soil and do not break or collapse from weight of reinforcement and other construction loads.
- .11 Supply horizontal reinforcing spacers in walls to ensure reinforcing does not move during placement.
- .12 Support reinforcement laterally in pairs on opposite faces of walls, columns and beams.
- .13 Provide minimum concrete cover to reinforcing steel in accordance with CSA-A23.1, Clause 12.6 except where indicated on Drawings and typical details.

Concrete Reinforcement

- .14 At concrete surfaces to receive bush-hammered finish, provide additional cover of 6 mm ($\frac{1}{4}$ ") unless otherwise indicated on Drawings.
- .15 Where a structural concrete member is required to have a fire-resistance rating as identified on Drawings or in Specifications, provide minimum concrete cover to reinforcing steel in accordance with Chapter 2 of the Supplement to the National Building Code, "Fire Performance Ratings".
- .16 Do not re-bend or straighten reinforcing steel after initial fabrication, unless so indicated on Drawings or in written instructions of Consultant.
- .17 Ensure reinforcing is clean, free of loose scale, dirt, oil, rust and other foreign coatings.
- .18 Place reinforcement for interior and exterior slabs on grade as indicated on Drawings. Place and support uniformly above centre line of slab, and have a minimum concrete top cover of 40 mm interior, 50 mm exterior.
- .19 Place reinforcing for slab on grade on precast concrete chairs or other approved supports at correct height.
- .20 Obtain written approval from Consultant prior to cutting of reinforcing to accommodate openings, or embedded items or to accommodate precast concrete, structural steel or timber connections. Allow for additional splice material which may be required to reinforce these cut bars as directed by Consultant.
- .21 Tie, do not weld, reinforcement in place.
- .22 Install mechanical connection splices and end bearing splices in accordance with manufacturer's instructions.
- .23 Metal Filled Sleeve Splices:
 - .1 Remove dirt, loose mill scale and rust from end surfaces of sleeved bars.
 - .2 Secure bars in concentric alignment with ends separated by 3 mm ($\frac{1}{8}$ ") to 6 mm ($\frac{1}{4}$ ").
 - .3 Install filler metal so that space between ends of bars and voids in sleeve are filled.
 - .4 Confirm that sound filler metal is present at both ends of sleeve and at entry port.
- .24 End-Bearing Splices:
 - .1 Remove dirt, loose mill scale and rust from bar surfaces to be enclosed by splice, at time of installation. Remove burrs that may separate bearing faces.
 - .2 Rotate upper bar to provide most complete contact between bearing faces.
 - .3 Install a cloaking sleeve to hold spliced bars in secure alignment, and with an inspection hole opposite contact faces facing outwards.
 - .4 Face sleeved flanges or projections to inside of column.

Concrete Reinforcement

- .5 Provide reducer inserts when spliced bars differ by one bar size.
- .6 Verify by physical measurement that bar ends terminate in flat surfaces within 1.5 degrees of a right angle to the axis of bar, and are fitted within 3 degrees of full bearing.
- .29 Reinforcement for Separate Topping:
 - .1 Reinforce separate toppings 50 mm thick and over.
 - .2 Reinforce with flat sheets of welded steel wire fabric:
 - :102 x 102 MW13.3 x MW13.3 for toppings 50 mm to 75 mm thick.
 - :102 x 102 MW18.7 x MW18.7 for toppings over 75 mm to 100 mm thick.
 - :10M @ 300 each way for toppings over 100 mm thick.
 - .3 Place wire fabric 40 mm below finished concrete surface.
- .30 Epoxy-Coated Reinforcement:
 - .1 Provide epoxy-coated bars for reinforcement that is within 100 mm of top surface of slabs of walkways, roads, driveways, parking areas, loading docks and ramps thereto, including chair bars, and bars extending into slab from columns, walls, balustrades and curbs.
 - .2 Provide epoxy-coated top and bottom bars, dowels, and stirrups, in parking structure floor areas not protected by membrane, including stairs, landings, lobbies, curbs, and islands, and within 1000 mm of expansion joints.
 - .3 Repair all visible damage and bare areas including bar ends. Remove loose or deleterious material. Remove any rust by blast cleaning. Coat area with epoxy provided by epoxy-coated bar supplier.
 - .4 Do not use bars with more than 1 percent of surface area covered by patching material.
 - .5 Sheared and cut ends to be coated with patching material.
 - .6 Approved mechanically spliced reinforcement to have all parts coated with patching material.
 - .7 Approved welded spliced reinforcement to have all welds and splice material coated with patching material.
 - .8 Increase bending radii of epoxy-coated reinforcement in accordance with recognized standards to ensure coating does not crack.
- .31 Concrete Fireproofing:
 - .1 Encase structural steel members with concrete where indicated on structural Drawings or where noted "C.F." on Drawings.

Concrete Reinforcement

- .2 Completely wrap members with 102 x 102 MW9.2 MW9.2 welded steel wire fabric. For interior beams less than 450 mm deep, fabric may be wrapped around bottom flange only.

3.4 Adjusting and Cleaning

- .1 Adjust and secure reinforcement in correct position immediately before concrete is placed.
- .2 Remove contaminants which lessen bond between concrete and reinforcement.

3.5 Field Quality Control

- .1 Provide competent supervisor, with at least three years experience in reinforcement placement, to direct placement of reinforcement.
- .2 Inspect placement of reinforcement for conformance with Drawings and Specifications, before each concrete placement, and correct as necessary.
- .3 Be aware that Consultant's periodic review of selected areas of reinforcement are for verification of conformity to design concept and general arrangement only, and shall not relieve Contractor of responsibility for quality control, errors, or omissions, or conformance with requirements of Contract Documents.
- .4 Inspection and Testing Company, when appointed as specified in Source Quality Control elsewhere in this Section, shall perform:
 - .1 Identify and correlate reinforcing steel with test results.
 - .2 Test unidentified reinforcing steel.
 - .3 General inspection of reinforcing steel placement size.

3.6 Defective Work

- .1 Incorrectly fabricated, misplaced, or omitted reinforcement, variations in excess of specified tolerances and failure of materials or workmanship to meet requirements of this specification will be considered defective Work performed by this Section.
- .2 Replace or adjust defective Work, before concrete is placed as directed by Consultant.
- .3 Replace or strengthen concrete Work which is deficient as a result of incorrectly fabricated, misplaced, or omitted reinforcement, which was not corrected before concrete was placed.
- .4 Contractor shall pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work is deficient or fails to meet the Drawings, or shop or field work drawing details. Costs for additional inspection, testing, review and redesign to be deducted from Contract Value.

END OF SECTION

Cast-in-Place Concrete

PART 1 - GENERAL

1.1 General Requirements

- .1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.
- .2 Quantities and dimensions enclosed in brackets apply to Project for which Drawings are in imperial units.
- .3 Contractor shall obtain a copy of CSA Standards A23.1, and A23.2 and maintain on site.

1.2 Description

- .1 Sections Which Specify Concrete Work Performed in Compliance with This Section:
 - .1 Excavated Caissons Section 31 63 23
- .2 Related Work Specified in Other Sections
 - .1 Submittals and Shop Drawings Section 01 30 00
 - .2 Quality Control Section 01 40 00
 - .3 Excavation and Backfill Section 31 23 10
 - .4 Steel Pipe Pile Foundations Section 31 62 00
 - .5 Drainage Section 33 46 00
 - .6 Concrete Accessories Section 03 15 00
 - .7 Concrete Reinforcement Section 03 20 00
 - .8 Concrete Floor Finishes Section 03 35 00
 - .9 Grout Section 03 37 00
 - .10 Supply of Anchor Bolts, Plates and Accessories for Structural Steel Work (to be Cast in Concrete) Section 05 12 00
 - .11 Metal Fabrications (to be Cast in Concrete) Section 05 50 00
 - .12 Metal Stairs Section 05 51 00
 - .13 Preparing Concrete Surfaces to Receive Dampproofing and Waterproofing
 - 07 11 00
 - 07 14 16
 - 07 11 00
 - .14 Process Items (to be Cast in Concrete) Division 11 and 14
 - .15 Mechanical Items (to be Cast in Concrete) Division 21, 22 and 23

Cast-in-Place Concrete

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|-----|---|------------------------------------|
| .16 | Electrical Items (to be Cast in Concrete) | Division 26, 27 and 28 |
| .17 | Equipment bases, exterior catch basins and manholes and similar Work specified for inclusion under mechanical and electrical Work | Division 21, 22, 23, 26, 27 and 28 |
- .3 Work Installed but Supplied under Other Sections
- .1 Install materials specified to be supplied under other Sections of these project Specifications. Materials include but are not limited to:
- .1 Fabricated components, anchor bolts, bearing plates, sleeves and other inserts to be built into concrete.
- .2 Ensure installation is to satisfaction of trades concerned and of Consultant prior to placing concrete.
- .3 Cooperation with Work of Other Sections:
- .1 Check project Drawings and specifications for requirements of other Sections, which will affect installation of Work of this Section.
- .4 Cooperation with Consultant:
- .1 Before commencing Work, review with Consultant, Work performed under this Section.
- .2 Schedule Work to allow sufficient time and access for Consultant to carry out periodic field review.
- .5 Cooperation with Inspection and Testing Company:
- .1 Contractor to provide casual labour to Inspection and Testing Company's field personnel for purpose of obtaining and handling sample materials. Provide free access to all portions of Work, and cooperate with the Inspection and Testing Company.
- .2 Contractor to advise Inspection and Testing Company a minimum of 24 hours in advance of concrete placement.
- .3 Contractor to provide properly designed temperature-controlled storage boxes for test cylinders, as specified in CSA-A23.2-3C, for a period of at least 24 hours and further protection from adverse weather and mishandling until removed from site. Contractor to provide a max-min thermometer for each storage box. Storage in a portable building that will be used by Contractor's personnel or Consultant during first 24 hour storage period will not be permitted. Storage facilities shall be provided, installed, checked and approved before any concrete may be placed.

Cast-in-Place Concrete

.6 Architectural Concrete:

- .1 Architectural concrete shall mean concrete surfaces designated as "architectural concrete" in Contract Documents. Sandblasted and bush-hammered surfaces shall be considered as architectural concrete.

1.3 Quality Assurance

.1 Reference Standards and Publications:

- .1 All standards to be latest issue at time of tender.
- .2 Provide one copy on site of the first three standards listed below.
- .3 The following reference standards shall govern work of this Section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following Standards apply but are not necessarily repeated in following list:
- .1 2012 OBC, "Ontario Building Code".
- .2 CSA-A23.1-19, "Concrete Materials and Methods of Concrete Construction".
- .3 CSA-A23.2-19, "Methods of Test for Concrete".
- .4 CSA-A23.3-19, "Design of Concrete Structures for Buildings".
- .5 ACI 117-10, Standard Specifications for Tolerances for Concrete Construction and Materials, American Concrete Institute.
- .6 CSA-A283-2000, "Qualification Code for Concrete Testing Laboratories".
- .7 CAN/CSA-A363-M88 (R1996) "Cementitious Hydraulic Slag".
- .4 ASTM D3963/D3963M-21, "Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel".
- .1 ASTM C260/C260M-10a(2016), "Standard Specification for Air-Entraining Admixtures for Concrete".
- .2 ASTM C494/C494M-19e1, "Standard Specification for Chemical Admixtures for Concrete".
- .3 American Society for Testing and Materials (ASTM) where noted.
- .4 American Concrete Institute Detailing Manual (ACI 315R-18) where noted.
- .5 Concrete Reinforcing Steel Institute (CRSI) where noted.
- .6 Reinforcing Steel Institute of Canada (RISC), "Manual of Standard Practice, Metric Supplement" where noted.

Cast-in-Place Concrete

- .7 Provincial safety standards where applicable.
- .8 Conform to applicable safety regulations for erection, maintenance and removal of formwork.
- .2 Regulations
 - .4 Abide by current bylaws and regulations of province and/or municipality in which Work is located, and abide by current laws and regulations with regard to public safety.
 - .5 Regulations of the Minister of Labour, Occupational Health and Safety Act, Workers' Compensation Board and other applicable acts administered by authority having jurisdiction of province apply to Work of this Section.
- .3 Safety
 - .4 Carry out cast-in-place concrete work in accordance with Ontario Building Code and current Occupational Health and Safety Act construction safety regulations.
- .4 Qualifications:
 - .4 Undertake concrete finishing only by member organizations of Concrete Floor Contractors Association of Ontario.
- .5 Tolerances:
 - .4 In accordance with ACI 117; definitions for tolerance terminology and tolerances for formed concrete surfaces are recapitulated in Section 03100, Concrete Formwork.
 - .5 Difference between elevation of high point and low point in specified area not to exceed:

In any bay up to 100 m ² (1100 ft ²):	12 mm (½")
In any bay up to 400 m ² (4300 ft ²)	25 mm (1")
- .6 F-Number System:
 - .1 Finish floor slabs to meet following tolerance classification in accordance with CSA Standard A23.1, Clause 22.1.3 and Table 16.
 - :Class A – Conventional Smooth
 - :Class B – Conventional Non-slip
 - :Class C – Moderately Flat
 - :Class D - Flat
 - .7 Measure FL levelness tolerance at 72 ± 12 hours after completion of floor finishing, on formed slabs before removal of shores and on slabs-on-grade.
 - .8 Straightedge Method:

Cast-in-Place Concrete

- .1 Finish floor slabs to meet following tolerances when measured at 72 ± 12 hours after completion of floor finishing, before shores are removed from formed slabs, by placing a freestanding unlevelled straightedge anywhere on slab and allowing it to rest on two high spots. Gap between straightedge placed on two high spots and floor surface not to exceed:
- | | |
|--------------------------|--------------|
| 3 m (10 ft) straightedge | 8 mm (5/16") |
| 2 m (6 ft) straightedge | 4 mm (3/16") |
- .6 Sample for Floor Finishing:
- .4 Finish and cure an area of floor slab where directed by Consultant to provide sample of finish and curing procedures for approval.
- .5 Provide new sample area until finish is approved.
- .6 If liquid membrane curing compound is to be used on Project, determine and apply correct quantity required to meet rate of coverage recommended by manufacturer for measured test area.
- .7 Approved sample will provide standard by which subsequent finishing will be judged and will be incorporated into Work.
- .7 Job Mock-Up of Formed Surface:
- .4 Provide and place specified concrete for Project and to meet requirements of mock-up specified in Section 03 10 00, Concrete Formwork.
- .5 Provide additional mock-up area for architectural finishing samples. Finish portions of area in varying degrees of sandblasting to provide acceptable finish for approval of Consultant. Finish portions of area in varying degrees of bush-hammering to provide acceptable finish for approval of Consultant.
- .6 Approved mock-up will provide standard by which subsequent Project Work will be judged acceptable.
- .8 Source Quality Control:
- .4 Both source quality control and field quality control specified elsewhere in this Section, may be performed by an Inspection and Testing Company appointed by Consultant.
- .5 Review provided by Inspection and Testing Company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of this Specification.
- .6 Inspection and Testing Company shall be certified under CSA Standard A283, Qualification Code for Concrete Testing Laboratories, for Category 1 Certification.

Cast-in-Place Concrete

- .7 Payment for specified Work performed by Inspection and Testing Company will be made by Owner.
- .8 Provide access for inspection to all places where Work is manufactured, stockpiled or installed.
- .9 Perform Work of source quality control in accordance with CSA Standard A23.2 and to include:
 - .1 Verification that ready-mix supplier is qualified to supply concrete in accordance with Specification.
 - .2 Review of proposed concrete mix designs.
 - .3 Sampling, inspection, and testing of materials as may be required.

1.4 Submittals

- .1 Submit proposed mix design for concrete and grout mix types to Consultant for approval a minimum of two weeks prior to their initial use.
- .2 Provide supporting evidence of compliance with requirements. Review of mix design does not relieve Contractor from responsibility for compliance with Contract Documents.
- .3 Submit data sheets for proposed pre-mixed grouts to Consultant for review.
- .4 Submit samples of fine and coarse aggregate and all admixtures proposed for concrete mixes to the testing firm's laboratory if requested by Consultant.
- .5 Prior to conducting trial mixes, submit data on specified or proposed concrete admixtures with mix design to Consultant for approval. Data is to confirm the compatibility of the water reducing admixture, superplasticizer, air entraining agent, cement, fly ash and silica fume where used.
- .6 Submit copies of mill certificate test reports of cement and silica fume if requested by Consultant.
- .7 Submit proposed joint details, locations and construction procedures. Include waterstop, crack inducer, reglet, sealant and joint filler products as required.
- .8 Submit proposed curing procedures.
- .9 Submit proposed methods of protection of concrete when air temperatures are expected to be above 25°C or below 5°C.
- .10 Submit proposed procedures for applying separate floor topping.
- .11 Inspection and Testing Reports:
 - .1 Inspection and Testing Company shall:

Cast-in-Place Concrete

- .1 Base inspection and testing upon Contract Drawings, specifications and concrete mix design submissions.
- .2 Report results of tests immediately to Contractor. Contractor is responsible for ensuring that concrete meets requirements of Specifications.
- .3 Report immediately to Consultant, by phone, any deviations from above, giving recommendations for further testing deemed necessary. No modifications to be made or instructions given without prior approval of Consultant.
- .4 Submit to Consultant and Contractor certified copies of test results. Include the following information with the results:
 - .1 Name of the project.
 - .2 Date of sampling.
 - .3 Mix design, specified strength, slump and air content, class of exposure.
 - .4 Name of supplier, truck and ticket number.
 - .5 Time batched and time sample taken.
 - .6 Identification of sampling and testing technician.
 - .7 Cement type and admixtures used.
 - .8 Exact location in structure of concrete sampled.
 - .9 Ambient air and concrete temperatures.
 - .10 Nominal aggregate size.
 - .11 Water added and personnel authorizing additional water.
 - .12 Concrete density.
 - .13 Test strength of cylinder.
 - .14 Type of failure if test fails to meet specification.
- .5 Certify, in writing, that concrete meets specified requirements.
- .6 Submit to Consultant a final report certifying that concrete is in accordance with Contract Documents. Submit report under seal and signature of a professional engineer registered in the Province of Ontario.
- .7 Distribute inspection reports as follows:

Cast-in-Place Concrete

- 2 copies to Consultant.
 - 1 copy to Consulting Structural Engineer.
 - 2 copies to Contactor.
- .8 Sign report by inspector or technician who performs inspection or test.
- .12 Submit responses to site review reports stating that all reported defects and deficiency items were corrected or stating what action was taken.
- .13 Joint Location Drawings:
- .1 Submit drawings showing proposed location of control joints in slab-on-grade, where not shown on Drawings.

1.5 Project Records

- .1 Concrete Pour Records:
- .1 Record time, date, delivery slip serial number, and location in building of each concrete pour, and identify related test cylinders. Keep these records on site until Project is completed.
- .2 Delivery Records:
- .1 File duplicate copies of concrete delivery slips on which shall be recorded: supplier, serial number of slip, date, truck number, contractor, project, class of exposure, cementing materials content, air content, volume in load, and time of first mixing of aggregate, cementing materials and water.
- .3 Record Drawings:
- .1 Record on a set of Drawings:
- .1 Time and date of each pour
 - .2 High and low ambient air temperatures during each pour
 - .3 Date of removal of forms in each area
 - .4 Founding elevations of all foundation elements.
 - .5 Variations of foundation Work from that indicated on Drawings.
- .2 Make record drawings available for Consultant's inspection at all times.

1.6 Sample Panels

- .1 Cast concrete against sample formwork panels. Obtain approval by Consultant of resultant surface finish prior to erecting subsequent forms.
- .2 Include a repaired area on the sample for approval by Consultant.

Cast-in-Place Concrete

- .3 Changes in concrete mix proportions, source of material or construction materials are subject to new samples and approval of Consultant.
- .4 The approved sample concrete panels shall be considered basis of quality for finished Work. Locate where directed.
- .5 Sample panels to remain exposed to view for duration of concrete Work.

1.7 Delivery, Storage and Handling

- .1 Deliver materials supplied under Work of this Section to site in bundles easily identified and properly marked to locations directed, and to meet construction schedule.
- .2 Exercise care in storing and handling materials of this Section on site in manner to prevent damage and contamination.

1.8 Job Conditions

- .1 Environmental Conditions:

In addition to Cold Weather and Hot Weather Requirements of CSA Standard A23.1, the following shall apply to Work of this Section:

- .1 Provide protection or heat, or both, so that temperature of concrete at surfaces is maintained at not less than 21°C (70°F) for three days after placing, not less than 10°C (50°F) for the next two days and above freezing for the next two days.
- .2 Do not permit alternate freezing and thawing for fourteen days after placing.
- .3 Vent exhaust gases from combustion type heaters to atmosphere outside using protection enclosures.
- .4 Provide protection to maintain concrete continuously moist during curing period.
- .5 For field cured cylinders representing strength development of in-situ concrete, provide same specified hot and cold weather protection for storage of each concrete compression specimen as for concrete from which it was taken, until it is sent to testing laboratory.
- .6 Do not place concrete when it is raining. Should rain commence during placing, cover freshly placed concrete.
- .7 Do not place bonded toppings on rough slabs that are less than 15°C (60°F).
- .8 Do not grout at ambient air temperatures or concrete surface temperatures less than 5°C (40°F), or when temperature is forecast to fall to less than 5°C (40°F) within 24 hours of grouting.
- .9 Do not apply sealants at ambient air temperatures or concrete surface temperatures less than 5°C (40°F).
- .2 Protection:

Cast-in-Place Concrete

- .1 Protect floor slabs, and concrete surfaces exposed to view or on which finishes are to be applied, from grease, oil, and other items which will affect appearance of concrete, or impair bond of toppings or finish materials.

1.9 Quality Control

- .1 Contractor shall not assign responsibility of coordination of placing required material and placing concrete. Ensure a full-time qualified superintendent representing Contractor is in attendance to inspect and check all phases of Work.

1.10 Aggregate Tests

PART 2 - PRODUCTS

2.1 Unit Prices

- .1 Unit prices requested as a part of the Tender shall include concrete, placing, curing, finishing, and preparation and submittal of necessary mix designs.
- .2 Unit prices to be applied to the net volume difference.

2.2 Materials

- .1 Generally:
 - .1 In accordance with Reference Standards.
- .2 Cementing Materials
 - .1 Portland cement: to CAN/CSA-A5, Type 10 – normal. Cement shall not contain total sodium oxide equivalent in excess of 0.6% by mass and the tri-calcium aluminate content shall be between 6% and 10%.
- .3 Supplementary Cementing Material
 - .1 Fly ash shall be Type F pozzolan and shall meet requirements identified in CAN/CSA-A23.5 with following additional requirements:

.1	Minimum SiO ₂ and Al ₂ O ₃ and Fe ₂ O ₃ content	70%
.2	Maximum retained on 45 NM sieve	20%
.3	Maximum loss of ignition	4%
.4	Maximum Na ₂ O equivalent	3%
.5	Maximum CaO content	8%
 - .2 Cementitious Hydraulic Slag: to CSA Standard CAN/CSA-A23.5.
- .4 Aggregates
 - .1 For concrete mix types, fine aggregate shall conform to requirements identified in CSA-A23.1 for specified exposure class.

Cast-in-Place Concrete

- .1 Fine aggregate tested in accordance with CSA Test Method A23.-7A, "Organic Impurities in Sands for Concrete", shall produce colour not darker than standard colour (Organic Plate Number 3). Aggregate producing colour darker than standard colour will be rejected; provisions 5.3.3.2(a) and (b) of CSA-A23.1-M shall not apply.
- .2 For slabs-on-grade, fineness modulus of fine aggregate shall be between 2.7 and 3.1.
- .2 For all concrete mix types, the coarse aggregate shall conform to requirements identified in CSA-A23.1 for specified exposure class. Aggregate shall meet Group 1 gradation requirements listed in Table 2 of CSA-A23.1.
 - .1 20 mm (3/4") to 5 mm (No. 4 sieve) except as specified below.
 - .2 For Slabs-on-Grade:
 - .1 Abrasion loss not to exceed 35%.
 - .2 Petrographic number of aggregate not to exceed 125 when tested in accordance with ASTM C295, as conducted by Ministry of Transport of Ontario.
 - .3 For Slabs-on-Grade 125 mm (5") and Thicker:
 - .1 40 mm (1½") to 5 mm (No. 4 sieve); combine at least two of the single sizes specified in Table 2 Group II of CSA Standard A23.1, one of which is to be 40 mm (1½"), to obtain maximum bulk density (unit weight) and optimum grading, in accordance with an approved procedure.
 - .4 For Slabs Over Open Web Steel Joists (OWSJ), Waffle Slabs and Bonded Toppings 50 mm (2") Thick and Less: 12 mm (½") to 5 mm (No. 4 sieve).
 - .5 For Columns Less Than 300 mm (12") in Least Dimension, or Less Than 95,000 mm² (150 in²) in cross-sectional areas: 10 mm (3/8") to 5 mm (No. 4 sieve).
- .3 Traprock Aggregate:
 - .1 Hard, fine-grained igneous rock with "lath-like" crystals interflocked; having a loss in 5 cycles of no more than 5% by weight when tested for soundness by magnesium sulphate in accordance with CSA Test Method A23.2-9A, a maximum absorption of 1% when tested in accordance with ASTM C127, and a maximum petrographic number of 100.
- .4 Aggregates shall not react with alkalis in cement to an extent that results in excessive expansion of concrete.

Cast-in-Place Concrete

- .5 Source of aggregate and method of manufacture or production, including type of equipment used, shall not be altered for duration of project following acceptance of aggregate.
- .6 Lightweight aggregates for structural light weight concrete to conform to ASTM C330.
- .7 Do not use light weight aggregates in concrete for exposure classes F and C.
- .5 Water
 - .1 Water for use in concrete production and curing shall be clean and free from injurious amounts of oil, acid, alkali, soluble chlorides, organic matter, sediment or any other deleterious substances as per CSA-A23.1.
- .6 Admixtures
 - .1 Conform to Reference Standards for chemical and air-entraining admixtures.
 - .2 Provide only admixtures that are free of chlorides.
 - .3 Air-entraining admixtures shall conform to requirements of ASTM C260. Admixture shall be of uniform consistency and quality within each container and from shipment to shipment.
 - .4 Water-reducing admixtures shall conform to requirements of ASTM C494, Type A or D. Admixture shall be of uniform consistency and quality within each container and from shipment to shipment.
 - .5 Superplasticizers, if approved by Consultant, (high-range water reducers) shall conform to requirements of ASTM C494, Type F or G.
 - .6 When requested, provide evidence acceptable to Consultant that superplasticizer does not increase shrinkage of concrete.
- .7 Guniting
 - .1 Portland cement: To CAN/CSA-A5, Normal, Type 10.
 - .2 Water and aggregates: To ACI 506.2-77.
- .8 Polypropylene Fibre Reinforcing:
 - :M/D fibrillated polypropylene fibres, Fibremesh by Master Builders Technologies.
- .9 Steel Fibres:
 - :Dramix ZC 60 x 1.00, by Dramicon Inc.
 - :Eurosteel 60-100, by Nu-Tech Fiber-Con Inc., Toronto, Ontario.

Cast-in-Place Concrete

.10 Granular Underbed for Slabs-on-Grade:

- .1 20 mm (3/4") clear limestone, proof rolled for compaction, compacted thickness 150 mm (6") under slabs 125 mm (5") or less, 200 mm (8") under thicker slabs.

2.3 Concrete Mixes

.1 Concrete:

- .1 Contractor shall design concrete mixes and shall pay for costs associated with development of mix designs.
- .2 Contractor shall supply concrete in accordance with CSA-A23.1, Clause 4.1, Table 5, Alternative 1 and Tables 1, 2 and 4, except that additional requirements of this Specification and concrete mix table on Drawings shall also apply.
- .3 Only such materials or blends of materials that will result in a uniform colour of exposed surfaces shall be used.
- .4 Concrete mixes that will be placed by concrete pump shall be designed for pumping.
- .5 In event that slump and/or air content are outside specified tolerance range as determined by inspection and testing firm appointed by Consultant, Consultant may, at his sole discretion, accept a proposal for one adjustment of the deficient condition as an alternate to rejection.
- .6 Maximum placement temperature of 18°C is specified to ensure that concrete temperatures do not exceed 60°C during curing, that temperature gradients do not exceed 20°C total and temperature rise or drop do not exceed a maximum heating and cooling rate of 2°C/hour. Maximum placement temperature may be increased to 25°C provided above temperature requirements are met.
- .7 Incorporate cementitious hydraulic slag as follows:
- .1 Class of exposure C-1 with 25 percent of Portland cement replaced with cementitious hydraulic slag: for parking garage floors, and walls, balustrades and columns adjacent thereto, and footings. Conform to additional requirements of CSA Standard S413, Parking Structures, Clause 6.1.
- .2 Class of exposure C-2 with 25 percent of Portland cement replaced with cementitious hydraulic slag: for pavements, sidewalks, curbs and gutters.
- .3 Class of exposure F-2 with 25 percent of Portland cement replaced with cementitious hydraulic slag: for basement walls and basement slabs, and for exposed exterior beams, columns, walls and slabs.
- .8 Supply concrete in accordance with CSA-A23.1 with properties as noted on Drawings
- .9 Slabs-on-Grade:
-

Cast-in-Place Concrete

- .1 Use Type 20 Portland cement, or replace 25 percent of Type 10 Portland cement with cementitious hydraulic slag. When mean daily temperature is less than 10°C, reduce Portland cement replacement to 10 percent.
- .2 Use water/cementing materials ratio of 0.45 maximum.
- .3 Use aggregates specified in paragraphs 2.2.4.1 and 2.2.4.2.
- .4 Cementing materials content 320 kg/m³ (515 lb/yd³).
- .5 Modulus of rupture 3.5 MPa (510 psi) average, 3.0 MPa (435 psi) minimum.
- .6 Slump at delivery, before addition of superplasticizer, 50 mm (2"); add superplasticizer, not water, to bring slump to level acceptable to floor finisher for placement.
- .10 Refer to Section 02365 for concrete mix for expanded base concrete piles.
- .11 Water-soluble chloride ion content in exposure class C-1 concrete before exposure shall not exceed 0.06% by mass of cementing material.
- .12 Aggregate size specified is maximum nominal allowance. Contractor may use smaller nominal size to ease placing. Air content may have to be increased for smaller aggregate to meet exposure class requirements.
- .13 Ensure aggregate does not react with alkalis in the cement or produce excessive expansion in concrete. Conform to Appendix B of CSA-A23.1.
- .14 Cement: Use Type 10, except use Type 50 for concrete in contact with soil.
- .15 Minimum cement content:
 - .1 380 kg/m³ (total cementitious material) for Type A.
 - .2 350 kg/m³ for watertight or liquid-retaining structures.
 - .3 335 kg/m³ for exterior exposed concrete slabs.
 - .4 335 kg/m³ for concrete exposed to salts.
 - .5 335 kg/m³ for decks without silica fume, stairs and shallow footings in parking structures.
 - .6 335 kg/m³ for Type 50 cement.
- .16 Slump: No slumps outside the range of maximum or minimum will be permitted without written permission of Consultant. Supply slumps at 20 mm below maximum.
- .17 Air Content: All mix types with exposure classifications shall be air-entrained in accordance with concrete mix table on Drawings and CSA-A23.1.

Cast-in-Place Concrete

- .18 Air dry unit weight: minimum 2300 kg/m³ (145 lbs/ft³) adjusted proportionally for maximum air content listed in CSA Standard A23.1, clause 4.4.4, Table 4.
- .19 Use water-reducing admixture in concrete.
- .20 Do not change concrete mix proportions or source material for exposed concrete without written approval of Consultant.
- .21 Conform to CSA-A23.1 for architectural exposed concrete.
- .22 Use accelerating admixtures in cold weather only when approved by Consultant. If approved, use of admixtures will not relax cold weather placement requirements.
- .23 Do not use calcium chloride or admixtures containing calcium chloride.
- .24 Use set-retarding admixtures during hot weather with written approval of Consultant to prevent cold joints in concrete.
- .25 Use admixtures in strict accordance with manufacturer's recommendations.
- .26 Do not use non-specified admixtures unless approved in writing by Consultant. Where superplasticizers are thus approved, ensure mix designs are correctly adjusted for placement, strength, durability and air content requirements.
- .27 Columns:
 - .1 Incorporate superplasticizer to provide 200 mm (8") slump concrete for columns.
- .28 Documentation indicating compatibility of water reducing admixture, air entraining admixture, superplasticizing admixture (if any), cement, silica fume (if any) and fly ash (if any) shall be submitted upon request with mix design for review by Consultant.
- .29 Polypropylene Fibre Reinforced Concrete:
 - .1 Provide polypropylene fibres in concrete at 0.9 g/m³ (1.15 lb/yd³) in accordance with manufacturer's instructions.
- .30 Steel Fibre Reinforced Concrete:
 - .1 Provide cementing materials content of 285 kg/m³ (480 lb/yd³), a water/cementing materials ratio less than 0.50, and 25 kg/m³ (42 lb/yd³) of steel fibres (specified in paragraph 2.2.9). Supply concrete with slump of 50 mm (2") and incorporate superplasticizer at dosage sufficient to provide 100 mm (4") slump.
- .31 Floor Hardeners:
 - .1 Confirm that concrete mix contains only materials compatible with floor hardener.

Cast-in-Place Concrete

- .32 Sulphate Exposure:
 - .1 Provide concrete mix in accordance with Clause 4.1.1.6, Table 3 of CSA Standard A23.1, for concrete subject to sulphate attack, including caissons, and other concrete in contact with soil.
 - .2 Submit evidence, and material samples if requested, acceptable to Inspection and Testing Company to verify that proposed concrete mix design will produce specified quality of concrete.
- .2 Structural Semi-Low Density Concrete:
 - .1 Provide concrete incorporating pelletized slag aggregate and having air dry unit weight of 2000 kg/m³ (125 lbs/ft³) adjusted proportionally for maximum air content listed in CSA Standard A23.1, Clause 4.3.4.2, Table 4.
- .3 Concrete Toppings
 - .1 Provide topping with minimum 28 day compressive strength of 30 MPa.
 - .2 For floors left exposed and noted as traprock finish: Provide topping with traprock aggregate specified in sub-paragraph 2.2.4.3, and with minimum 28 day compressive strength of 35 MPa and maximum slump of 50 mm (2").
- .4 Architectural Concrete:
 - .1 For concrete designated as architectural concrete:
 - .1 Obtain aggregate and cement from same source at same time, for entire Project.
 - .2 Use tools and handling equipment that are absolutely clear of rust, salts, hardened concrete, and other harmful and foreign material.
- .5 **Grout**
 - .1 Dry Pack Grout Under Steel Plates and Where Grout Thickness Does Not Exceed 75 mm (3"):
 - .1 Mix one part Portland cement to two parts concrete sand that conforms to CSA Standard A23.1, with only sufficient water that mix will retain its shape when made into ball by hand.
 - .2 Dry Pack Grout for Underpinning and Where Grout Thickness Equals or Exceeds 75 mm (3"):
 - .1 Mix one part Portland cement, one and one-half (1½) parts concrete sand and two parts of 10 mm (3/8") pea gravel, with only sufficient water that mix will retain its shape when made into ball by hand.
- .6 Premixed Grout:
 - .1 Mix with water in accordance with manufacturer's printed instructions.

Cast-in-Place Concrete

- .1 Non-Shrink Metallic:
 - :Embeco 636 Grout, by Master Builders Ltd.
 - :Ferrogrout 939 Premix, by The Sternson Group, Brampton, Ontario
- .2 Non-Shrink Non-Metallic:
 - :CG-86, by W.R. Meadows of Canada Limited.
 - :Masterflow 713 Grout, by Master Builders Ltd.
 - :M-Bed Standard Premix, by Sika Canada Ltd.
 - :SIKA 212 by W.R. Meadows of Canada Ltd.
- .3 Flowable Grout Non-Metallic Shrinkage Compensating:
 - :M-Bed Superflow, by the Sika Canada Ltd.
 - :Masterflow 713, by Master Builders Ltd.
 - :In-Pakt Pre-Mix, by C.C. Chemicals Limited.
 - :V3 by W.R. Meadows of Canada Ltd.
 - :SIKA 212 HP by Sika Canada Ltd.
- .4 Epoxy grout: Non-shrink, high strength compound consisting of epoxy resins, hardeners and non-metallic aggregate for exterior use. Pre-mixed in strict accordance with manufacturer's instructions to obtain minimum compressive strength of 100 MPa in 28 days.
- .5 Cement grout: Non-shrink compound consisting of cement, sand, water and approved admixtures in accordance with CSA-A23.1, Clause 4.2. Mixed with sufficient water for placement and hydration, capable of developing minimum compressive strength of 25 MPa in 7 days and 35 MPa in 28 days. Grout exposed to freezing shall be air-entrained 7 to 10%.
- .6 Dry pack grout: Non-shrink compound consisting of non-metallic aggregate and water. Mixed with sufficient water for mixture to make a sound, solid pack and capable of developing compressive strength of 35 MPa at 28 days.
- .7 Non-shrink grout: Pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents. Pre-mixed in strict accordance with manufacturer's instructions to obtain minimum compressive strength of 16 MPa in 24 hours and 50 MPa in 28 days. Acceptable non-shrink grouts:
 - .1 Masterflow 713 Grout.
 - .2 Master Builders Set Non-Shrink Grout.
 - .3 Sika Grout 212.
 - .4 M-Bed Standard Grout.
 - .5 CPD Non-Shrink Grout.
 - .6 SonogROUT.
 - .7 CG-86 by W.R. Meadows.

Cast-in-Place Concrete

2.4 Storage and Handling of Materials

- .1 Cement and silica fume to be stored in a suitable weather-tight building that will protect these materials from dampness. Cement and silica fume to be free from lumps at all times during use in the Work. Cement and silica fume stored for length of time resulting in hardening or formation of lumps not to be used in Work.
- .2 Aggregates shall be handled so as to prevent segregation and to obtain uniformity of materials. Separated aggregates and aggregates secured from different sources shall be piled in separate stockpiles. Site of stockpiles shall be cleaned of foreign materials and shall be reasonably level and firm. If aggregates are placed directly on ground, material shall not be removed from stockpile within 150 mm (6") of ground level. This material is to remain undisturbed to avoid contaminating aggregate with ground material.

2.5 Equipment

- .1 Vibrators for Concrete Reinforced with Epoxy-Coated Bars:
 - .1 Kevlar/Polyurethane rubber headed vibrator manufactured by Oztec Industries Inc., and distributed by Castlefield Electric Tool Ltd., Toronto; Mega Industries Inc., Mississauga; and Nick's Power Tools Ltd., Weston, Ontario

PART 3 - EXECUTION

3.1 General

- .1 Perform cast-in-place concrete Work in accordance with requirements of CSA-A23.1, unless indicated otherwise on Drawings.

3.2 Examination

- .1 Confirm that subgrade of compacted fill conforms to requirements specified for backfilling before placing slab underbed.
- .2 Confirm that surfaces on which concrete is to be placed are free of frost and water before placing.
- .3 Confirm that reinforcement, dowels, control joints, inserts and all other built-in Work are in place and secured before placing concrete.

3.3 Preparation for Slabs-on-Grade

- .1 Granular Underbed:
 - .1 Obtain Geotechnical Consultant's written confirmation that prepared subgrade is acceptable for placement of granular underbed.
 - .2 Place granular underbed over entire area of building and proof roll.
 - .3 Obtain Geotechnical Consultant's confirmation that thickness, elevation and proof rolling of granular underbed are acceptable.

Cast-in-Place Concrete

- .4 Remove foreign materials from underbed and forms before placing concrete.

3.4 Placing Concrete

.1 Notification:

- .1 Notify Consultant at least 24 hours before commencing to place concrete, and 24 hours before wall forms are closed in. Regardless of any requirement of Reference Standards to inspect all of the work prior to placing concrete, field review of construction will be in accordance with Sampling Program. Allow time for corrective work for areas of unusual formwork and congested reinforcement.

- .2 Notify geotechnical engineer to inspect and verify soil conditions and bearing pressures of all foundation elements prior to placing concrete for mudslabs or foundations.

- .3 Do not place concrete against frozen ground, frozen concrete or frosted forms.

- .4 Place concrete in accordance with CSA-A23.1, Clause 7 and as specified herein.

.5 Beams, Girders, Columns:

- .1 Place beams, girders, brackets, column capitals and haunches monolithically with floor system.

.6 Concrete Placed over Open Web Steel Joists:

- .1 Transport and spread concrete over joist construction in a manner to prevent lateral deflection and twisting of joists.

.7 Concrete Fireproofing:

- .1 Encase structural steel members with concrete, where indicated on Structural Drawings or where noted "C.F." on Drawings.
- .2 Provide concrete of same strength as adjacent concrete framing. Provide 50 mm (2") minimum cover.

.8 Skim Slabs-on-Grade:

- .1 Place 75 mm (3") thick skim slab of 15 MPa concrete over compacted underbed, where indicated on Drawings.

.9 Fibre Reinforced Concrete:

- .1 Arrange for fibre supplier's representative to be present to review initial mixing and placing of concrete incorporating fibres.

.10 Future Extension:

- .1 Where pockets, chases, anchors, angle irons and other hardware are indicated on structural Drawings to allow for future lateral extension, grease exposed structural steel work and fill pockets and chases with 10 MPa concrete.

Cast-in-Place Concrete

- .11 In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and set solidly with non-shrink grout or as specified on Drawings. Holes for inserts shall be thoroughly cleaned.
- .12 Ensure hardware and other items to be cast into concrete are placed securely and will not cause undue hardship in placing concrete.
- .13 Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints and other critical items are not disturbed during concrete placement.
- .14 Revise, re-seat and correct improperly positioned reinforcing hardware and other embedded items immediately before concrete placement.
- .15 Ensure specified concrete cover around reinforcing is maintained.
- .16 Ensure waterstop is securely wired to reinforcing to prevent folding or movement during concrete placement. Maintaining the integrity and correct position of waterstop is critical to the performance of the structure.
- .17 Do not place concrete older than 2 hours from batch time.
- .18 Do not add water after batching unless in strict accordance with CSA-A23.1, Clause 5.2.4.3.2 and such that concrete conforms with specified mix design parameters.
- .19 Where concrete is placed on an inclined surface, placing operation is to begin at lower end of the slope and progress upward unless otherwise permitted by Consultant.
- .20 Place concrete and screed in accordance with lines and levels indicated on Drawings.
- .21 Place concrete in approximate horizontal layers such that each lift can be vibrated into the previous lift.
- .22 Maximum vertical free fall of concrete is not to exceed 1200 mm (4 ft) in unexposed work or 800 mm (2'-8") in exposed work. Confine concrete with a suitable vertical drop pipe to prevent segregation.
- .23 Place concrete directly into its final position in forms. Do not spread concrete with vibrators.
- .24 Compact concrete thoroughly by mechanical vibrators. Ensure concrete is worked around reinforcement, embedded items and into all areas and corners of forms.
- .25 Use internal vibrators in sections that are sufficiently large, and supplement with external type in event that satisfactory surfaces can not be obtained.
- .26 Check and re-adjust formwork to required lines and levels during placement of concrete.
- .27 Place concrete as a continuous operation, stopping only at construction joints.
- .28 Allow a minimum of three days between adjacent concrete placements, unless otherwise noted.
- .29 Place concrete in watertight structures with extreme care and extra effort.

Cast-in-Place Concrete

- .30 Consolidate and screed floors and slabs on grade level in accordance with CSA-A23.1, Clause 7, maintaining surface flatness as required for final floor finish. Pitch to drains 20 mm per meter nominal or as indicated on Drawings.
- .31 Provide slopes away from vertical surfaces such as columns, walls and balustrades on parking deck structural slabs.
- .32 Use cold weather concreting methods in accordance with CSA-A23.1, Clause 7.4.2.5 when mean daily temperature falls below 5°C, and use hot weather methods when the mean temperature rises above 25°C.
- .33 Maintain accurate records of concrete placement. Record date, location of placement, quantity, air temperature and test samples taken.

3.5 Placing of Architectural and Exposed Concrete

- .1 Place concrete in maximum horizontal lifts of 400 mm (16"). Limit length of concrete placement to prevent cold joints.
- .2 Do not place concrete from one end for full height of placement.
- .3 Use sufficient vibration equipment and methods to ensure dense, smooth concrete lines and surfaces free from bugholes, honeycombs and cold joints.
- .4 Ensure vibrator penetrates each layer of fresh concrete to prevent stratification.
- .5 In hot weather, use set retarding agents to prevent cold joints with permission of Consultant.

3.6 Separate Concrete Toppings

- .1 General:
 - .1 Prepare surface of previously-placed concrete substrate in accordance with CSA-A23.1, Clause 7.6.4, to create a roughened surface for adequate bond. Do not use acid unless approved by Consultant. Remove any loosened or delaminated concrete.
 - .2 Be aware that thickness of topping shown on Drawings is a minimum and actual thickness will be greater to account for cambers or deflections of supporting floor.
 - .3 Remove dust from prepared surface by vacuuming after surface is dry.
 - .4 Contact Consultant for inspection of prepared surface prior to application of grout coat or bonding agent.
 - .5 Thoroughly saturate concrete substrate with clean water for a minimum of 12 hours, and allow to surface-dry. Remove any standing water after saturation period.
 - .6 Apply cement/sand grout coat on substrate immediately prior to placing topping with properties and application in accordance with CSA-A23.1, Clause 7.6.4.2.2.

Cast-in-Place Concrete

- .7 Apply an approved bonding agent to substrate in accordance with manufacturer's instructions.
- .2 Placing and Compaction of Topping:
 - .1 Place concrete topping to required lines and levels indicated on Drawings to tolerance of +5 mm (3/16") to -0 mm (-0"), unless stricter tolerances are specified elsewhere. Place before grout coat stiffens or within timing per bonding agent's manufacturer's instructions.
 - .2 Place each section in one continuous operation.
 - .3 Take special precautions against plastic shrinkage cracking, whenever rapid drying of topping may occur, in accordance with CSA Standard A23.1, Clause 7.4.
 - .4 Finish and moist-cure topping as specified in other clauses. Any joints in substrate are to be matched in topping.
 - .5 Tensile bond strength between topping and substrate shall be minimum 0.9 MPa at 28 days as tested in accordance with CSA Test Method A23.2-6B by an independent inspection and testing agency at a frequency of one test for each 200 m² (2000 ft²) or less of area.
 - .6 Control Joints in Topping:
 - .1 Provide control joints for topping directly over construction joints in base slab.
 - .2 Provide control joints in toppings over precast slabs, on centre lines of supporting members, and at 5 m (18 ft) maximum spacing parallel to span of slabs.
 - .3 In all other respects, comply with sawcut control joint requirements for slabs-on-grade.

3.7 Finishing Concrete

- .1 Floor Finishing
 - .1 Refer to Section 03345 for concrete floor finishes.
- .2 Floor, Roof, Stair Treads, and Other Slab Surfaces:
 - .1 Perform finishing operations on plastic concrete surfaces in accordance with CSA Standard A23.1, Clause 7, and as specified herein.
 - .2 Be aware that finishing while bleed water is on surface, or adding water or cement to surface, are causes of scaling and dusting and are strictly forbidden.
 - .3 Be aware that concrete for this project contains slag cement which delays concrete set and onset of bleeding.

Cast-in-Place Concrete

- .4 Refer to Drawings, Schedules, and other Sections of Specification, for required finishes and concrete toppings.
- .5 Verify with those responsible for Work of other Sections, that proposed finish is satisfactory for application of their materials.
- .6 Finish floors to match approved sample
- .7 Screed surface to an even, level, or sloped surface, to elevations indicated on Drawings or required for specified finishes and concrete toppings.
- .8 Monolithic Concrete Toppings:
 - .1 Screed rough slab to level 25 mm (1") below finished floor. Apply topping while rough slab is still plastic.
- .9 Tile, Terrazzo, or Bonded Concrete Topping:
 - .1 Screed slab to level below finished floor necessary to accommodate finish material or topping. For bonded concrete topping, wire broom surface in accordance with CSA Standard A23.1, Clause 7.6.4. For tile or terrazzo, wire broom surface to texture approved by tile or terrazzo trade. Finish to conventional smooth classification.
- .10 Covered or Painted Floor Surfaces:
 - .1 Provide smooth steel trowelled surface, free from ridges, trowel marks or undulations, for floors that are to be painted, or to receive permanent architectural covering, such as carpet, wood, resilient flooring, sheet flooring, and fluid or trowel applied flooring.
- .11 Exposed Floor Surfaces or Present Roof/Future Floor:
 - .1 Provide hard, smooth, dense, steel trowelled surface, free from blemishes, and of uniform appearance.
- .12 Non-Slip Floor Surfaces:
 - .1 Provide swirl trowel final finish of texture acceptable to Consultant.
- .13 Hardened Floor Finish:
 - .1 Apply premixed material specified in Section 03150, prepackaged hardener, to total of 5 kg/m² (1 lb/ft²) of floor surface.
 - .2 Apply in two shakes, of half total specified amount in each shake; the second shake at right angles to the first.
 - .3 Finish as specified for "Exposed Floor Surfaces", sub-paragraph 3.7.2.11.
 - .4 Follow manufacturer's special finishing instructions if concrete is air entrained.

Cast-in-Place Concrete

- .14 Insulation Board or Built-Up Roofing:
 - .1 Hand or mechanical float surface to uniform texture, free from hollows, bumps and ridges. Finish to moderately flat classification.
- .15 Fluid Elastomeric Waterproofing Membrane:
 - .1 Provide smooth steel trowel surface, free from ridges, trowel marks, or undulations to specified slope, ensuring positive slope into drains. Do not overwork surface to prevent scaling. Use no more than a single pass of trowel. Do not complete finishing until all bleed water has evaporated.
 - .2 Finish to moderately flat classification.
 - .3 Do not finish too smoothly.
 - .4 Arrange for waterproofing trade to inspect finish after first area is completed and to reinspect until finish conforms to their requirements.
- .16 Hot Applied Rubberized Asphalt Waterproofing Membrane, or Self-Adhering Rubberized Asphalt Sheet:
 - .1 Hand or mechanical float surface to uniform texture, free from hollows, bumps, sharp edges, and ridges to the specified slope, ensuring positive slope into drains. Do not overwork surface to prevent scaling. Use no more than a single pass of trowel. Do not complete finishing until all bleed water has evaporated.
 - .2 Finish to moderately flat classification.
 - .3 Do not finish too smoothly.
 - .4 Arrange for waterproofing trade to inspect finish after first area is completed, and to reinspect until finish conforms to their requirements.
- .17 Dust-proofing agents: Apply in strict accordance with manufacturer's recommendations.
- .18 Shotblast:
 - .1 Shotblast floor surfaces that are to receive:
 - :fluid elastomeric membrane
 - :penetrant sealer
 - .2 Provide light sandblast to areas not accessible to shotblast equipment, such as near vertical surfaces. Do not shotblast or sandblast until at least 28 days after placing concrete.
- .3 Control Joints in Slabs-on-Grade:
 - .1 Sawcut control joints along column grid lines and additionally so that spacing does not exceed 30 times slab thickness, except where concrete mix incorporates 40 mm (1½") aggregate proportioned to provide maximum bulk

Cast-in-Place Concrete

- density in accordance with paragraph 2.2.4.2.2, sawcut so that spacing does not exceed 40 times slab thickness.
- .2 Sawcut before slab temperature starts to fall but commence within 18 hours of placement.
 - .3 For slabs placed in longitudinal strips, sawcut transversely in sequence at half, then quarter, then eighth points.
 - .4 Use 4 mm (3/16") diamond tipped saw blades.
 - .5 Sawcut unreinforced slabs to a depth of 0.25 slab thickness, fibre reinforced slabs to 0.33 slab thickness.
- .4 Joint Filler in Control Joints in Slabs-on-Grade:
- .1 For floors which will be covered with finish materials which conceal joint: clean residue from floor and joint, grind joints and cracks to within tolerances prior to filling, fill with latex-sand-cement mortar worked into joint, or place fine silica sand in bottom of joint and fill top 12 mm (½") of joint with specified control joint filler to flush top with surface; do not overfill. Ensure tile and terrazzo joints are coordinated with sawcut control joints to prevent cracking.
 - .2 s to prevent cracking.
 - .3 For permanently exposed floors: protect, prepare and fill joint in accordance with following sub-paragraphs.
 - .1 Keep off floor, construction traffic which may erode concrete at edges of sawcuts.
 - .1 Do not fill joints until as long as possible after placing slab, but in no case less than 90 days and after heating system is turned on.
 - .2 Arrange for representative of joint filler manufacturer to be present for a period of time at commencement of Work to verify that proper procedures are being employed.
 - .3 Clean sawcut residue from floor.
 - .4 Clean residue from joint by power washing with 9 MPa (1200 psi) water jet and let dry.
 - .5 Install joint filler to thoroughly dry surfaces only, at ambient air temperatures above 5°C (40°F).
 - .6 For interior floors, fill joints full depth with semi-rigid joint filler specified in Section 03 15 00; do not overfill.
 - .7 For floors exterior to building, install polyethylene backer rod, of diameter 25 percent greater than joint width, flush with top of floor, to exclude dirt. Immediately prior to filling joint, depress backer rod to bottom of joint and fill with elastomeric sealant specified in Section 03 15 00. Do not overfill.

Cast-in-Place Concrete

- .8 Cut off any overpour of filler on adjacent slab surface after filler has hardened.
 - .9 Immediately prior to handover of building, re-examine joint for separation of filler from slab. Clean separations with compressed air and fill.
- .5 Finishing Formed Surfaces
- .1 Finish concrete in accordance with CSA-A23.1, Clause 7.7.3. Ensure all concrete finishes are uniform.
 - .2 Rough-Form Finish: Concrete surfaces not exposed to view. Seal tie holes with non-shrink grout, repair defects and remove fins exceeding 5 mm.
 - .3 Smooth-Form Finish: Concrete surfaces exposed to view including ceilings and soffits. Surfaces shall be smooth, hard and uniform texture free from raised grain, torn surfaces, worn edges, patches, dents or other defects impairing texture. Seal tie holes with non-shrink grout, repair defects and remove fins.
 - .4 Smooth-Rubbed Finish: Concrete surfaces exposed to view to be painted as noted on Drawings. Seal tie holes with non-shrink grout, repair defects and remove fins. Rub wetted surface with carborundum brick within six hours of removing forms to obtain uniform colour and texture.
 - .5 Do not parge unless approved by Consultant.
 - .6 Waterproofed Surfaces Form Finish: Concrete surfaces to be waterproofed. Surfaces to have an open capillary system, cracks cleaned, holes filled and honeycombing prepared. Surfaces to be free from raised grain, torn surfaces, worn edges, patches, ridges, depressions, dents or other defects impairing the application or effectiveness of waterproofing. Seal tie holes with waterproofing, repair defects as recommended by manufacturer of waterproofing and remove all fins.
 - .7 Exposed Smooth-Form Finish: Concrete surfaces exposed to view and liquid face of liquid-retaining structures not being waterproofed. Surfaces shall be smooth, hard and of uniform texture free from raised grain, torn surfaces, worn edges, patches, dents or other defects impairing the texture. Seal tie holes with non-shrink grout, except use waterproofing on liquid face of liquid-retaining structures, repair defects and remove all fins.
 - .8 in, torn surfaces, worn edges, patches, dents or other defects impairing the texture. Seal tie holes with non-shrink grout, except use waterproofing on liquid face of liquid-retaining structures, repair defects and remove all fins.
 - .9 Obtain Consultant's approval of exposed concrete. Regrind or otherwise correct surfaces Consultant has not approved, and to his satisfaction.
 - .10 Plugs at Recessed Ties:
 - .1 Clean tie holes to remove all foreign matter.
 - .2 Coat plugs by dipping in adhesive and insert in hole.

Cast-in-Place Concrete

- .3 Remove excess adhesive immediately with thinner which will not stain concrete, as recommended by manufacturer.
- .11 Elastomeric Membrane:
 - .1 Provide light sandblast finish to vertical surfaces, where fluid elastomeric waterproofing membrane turns up vertical surface.
- .7 Curb Edging:
 - .1 Finish external corners of curbs rounded and smooth.
- .8 Architectural Finishing:
 - .1 Submit evidence that finishing contractor has at east three years of experience in this type of finishing.
 - .2 Sandblast concrete surfaces to medium texture evenly over each surface and consistently throughout Project to match approved mock-up.
 - .3 Protect other surfaces and equipment against damage resulting from sandblasting operations.
 - .4 Use material that will minimize environmental contamination.
 - .5 Bush-hammer concrete surfaces to medium texture evenly over each surface and consistently throughout Project to match approved mock-up. Take care to avoid breaking external corners of bush-hammered concrete.
 - .6 Remove debris from finishing operations.

3.7 Curing, Sealing and Protection

- .1 Cure and protect concrete in accordance with CSA-A23.1, Clause 7 and as specified herein.
- .2 Be aware that proper curing is essential for concrete, and failure to cure properly causes scaling, dusting and lack of durability.
- .3 Initial curing: Keep concrete surfaces continuously moist and cure at minimum temperature of 10°C for three days or for time required to obtain 35% of required 28 day strength.
- .4 Final curing: Immediately following initial curing and before concrete has dried, maintain curing to ensure required strengths and durability are obtained. Moist cure the following concrete at a minimum temperature of 10°C for times noted or for time required to obtain 70% of the 28 day strength.
 - .1 Foundation concrete exposed to sulphate attack shall be continuously moist cured for a minimum of seven days.
 - .2 Exterior exposed concrete shall be continuously moist cured for a minimum of seven days.

Cast-in-Place Concrete

- .3 Parking decks and concrete to be exposed to salts shall be continuously moist cured for a minimum of seven days.
- .5 Additional curing: Moist cure the following concrete at minimum temperature of 10°C for times noted.
 - .1 Reinforced massive sections shall be continuously moist cured for minimum of seven days.
 - .2 Unreinforced massive sections shall be continuously moist cured for minimum of ten days.
 - .3 Liquid retaining structures shall be moist cured for minimum of 10 days. Loosen wooden forms to allow water to run down inside.
- .6 Protect concrete from sudden temperature changes as noted in CSA-A23.1, Table 14.
- .7 Acceptable curing methods:
 - .1 Ponding or continuous sprinkling.
 - .2 Absorptive mat or fabric kept continuously wet (curing blanket or wet burlap).
 - .3 Continuous steam vapour mist bath not exceeding 70°C.
 - .4 Curing compounds approved by Consultant for type and rate of application.
 - .5 Waterproof paper or plastic film.
 - .6 Watertight forms left in place. Wood forms are not considered watertight unless coated or sealed to prevent moisture absorption.
 - .7 Other moisture-retaining method approved by Consultant.
- .8 Curing Compound Method:
 - .1 Use curing and sealing compound specified in Section 03 15 00 except:
 - .1 On surfaces to receive epoxy or similar paint finish, toppings, hardeners or other types of bonded finishes.
 - .2 On surfaces to which architectural finishes will be adhered, the adhesives for which are incompatible with the curing compound.
 - .3 Air-entrained concrete for exterior slabs and sidewalks placed between October 1 and April 1.
 - .2 Select water-based compound except in colder weather when temperatures are such that manufacturer recommends solvent-based compound.
 - .3 Apply curing and sealing compound in accordance with manufacturer's instructions, increasing application rate as necessary to cover surface completely.

Cast-in-Place Concrete

- .4 Where curing compounds are approved, apply in two applications at right angles to each other.
- .5 Confirm that coatings and curing compound are compatible.
- .9 Plastic Film Method:
 - .1 Where curing compound method cannot be used, cure finished floor surfaces not exposed to freezing and thawing or deicing chemicals as follows:
 - .1 Cover with 0.15 mm(6 mil) thick polyethylene sheets.
 - .2 Lap edges 100 mm (4") minimum and seal laps.
 - .3 Leave in place for "Basic Curing Period" in accordance with CSA Standard A23.1 Clause 21.1.2, but in no case for less than three days, and not less than seven days for exposed warehouse and industrial floor surfaces.
- .10 Curing Blanket or Wet Burlap Method:
 - .1 For parking garage floors; exterior sidewalks, pavements and curbs; and other finished concrete surfaces that will be exposed to freezing and thawing or deicing chemicals:
 - .1 Cover with curing blanket specified in Section 03 15 00, or wet burlap overlaid with 0.102 mm (4 mil) thick polyethylene, and maintain in place for the "Additional Curing for Durability" period in accordance with CSA Standard A23.1 Clause 7.4.1.6, but in no case for less than seven days.
 - .2 Wet blanket or burlap regularly to maintain in moist condition. Do not allow to dry out.
- .11 Protect freshly placed and consolidated concrete against damage or defacement from curing methods or adverse weather conditions.
- .12 Exterior concrete to be protected and allowed to air dry for 30 days prior to application of de-icing chemicals.
- .13 Cure coloured concrete with material recommended by the manufacturer of the coloring agent.
- .14 Do not use water curing during freezing weather.
- .15 During hot weather, begin curing process immediately after finishing. Use continuous water or absorptive mats.

3.9 Defective Concrete (Non-Architectural)

- .1 Immediately after removing forms, all concrete surfaces are to be inspected, and any imperfect joints, voids, stone pockets or other defective areas as specified are to be reported to Consultant at once and repaired before concrete is thoroughly dry. Defective areas are to be chipped away to a depth of not less than 25 mm with edges

Cast-in-Place Concrete

- perpendicular to the surface. Area to be repaired and a space at least 150 mm wide entirely surrounding it shall be wetted to a saturated surface dry condition to prevent absorption of water from the repair material.
- .2 Repair shall be made of the same material and of same proportions as used for the original concrete, except that coarse aggregate is to be omitted and cement added to match the colour of the surrounding concrete. Amount of mixing water shall be as little as is consistent with requirements for handling and placing. Mortar shall be re-tempered without addition of water by allowing it to stand for a period of one hour, during which time it shall be mixed with a trowel to prevent setting.
 - .3 Repair material shall be thoroughly compacted into place and screeded off to leave the repair slightly higher than the surrounding surface. It is then to be left undisturbed for a period of one to two hours to permit initial shrinkage before being finally finished. Repair shall then be finished to match adjoining surface and cured to requirements noted in this Specification.
 - .4 Watertight structures with honeycombing or embedded debris are not acceptable. Remove and replace concrete between construction joints.
 - .5 Report any shapes and lines outside the specified tolerances and repair or correct as directed by Consultant.

3.10 Grouting for Steel Members

- .1 Provide and place grout under column base and beam bearing plates. Cooperate with other trades that supply and set plates.
- .2 Damp concrete surfaces immediately before installing grout.
- .3 Install grout in a manner to ensure positive bearing of full area of steel plate.
- .4 Use non-shrink and shrinkage-compensating grouts only when grout will be contained against expansion and self-disintegration.
- .5 Slope grout beyond edge of plate at 45 degrees.
- .6 Provide same environmental protection and curing as specified for concrete.
- .7 Do not use flowable grout at beam bearing plates unless otherwise indicated, or approved by Consultant

3.11 Grout

- .1 Mix to flowable consistency, and apply in accordance with manufacturer's instructions.
- .2 Install epoxy grout in all pockets during erection.
- .3 Install cement grout in all sleeves.
- .4 Install non-shrink grout as required.

Cast-in-Place Concrete

3.12 Sealers

- .1 Silane Sealer
 - .1 Apply penetrant silane sealer specified in Section 03 15 00, to vertical surfaces, to a height of 1 m (3'-3") above floor, and from top of footing, or bottom of grade beams, to 1 m (3'-3") above slab-on-grade in garage.
 - .2 Lightly sandblast surfaces to receive penetrant sealer, within 72 hours before applying sealer.
 - .3 Verify surfaces are dry, and concrete is at least 28 days old, before applying sealer.
 - .4 Apply at manufacturer's recommended coverage rate.
 - .5 Application to be by an approved applicator competent in application of sealers in strict accordance with manufacturer's recommendations and directions.
- .2 Interior floor sealer: To be applied by an approved applicator competent in application of sealers in strict accordance with manufacturer's recommendations and directions.
- .3 strict accordance with manufacturer's recommendations and directions.

3.13 Sealants

- .1 Sealant:
 - .1 Joints exposed to view in walls and slabs with elastomeric sealant specified in Section 03 15 00, in colour selected by Consultant.
 - .2 Joints not exposed to view in walls with cold poured liquid neoprene sealant specified in Section 03 15 00.
 - .3 Joints not exposed to view in slabs with hot poured asphalt specified in Section 03 15 00, or cold poured liquid neoprene sealant specified in Section 03 15 00.
- .2 Apply sealant to thoroughly dry surfaces only, at ambient air temperatures above 5°C (40°F).
- .3 Confirm that preformed joint filler and backer rod are compatible with sealant.
- .4 Seal control joints in slab-on-grade in accordance with paragraph 3.7.4.
- .5 Seal other joints in accordance with following:
 - .1 Do not commence joint preparation until concrete is at least 28 days old.
 - .2 Thoroughly clean sides of joints with mason's router, or power saw, equipped with double blade where necessary to suit joint width.
 - .3 Blow clean with compressed air with oil trap on line, or vacuum clean.

Cast-in-Place Concrete

- .4 Install backer rod of diameter 25 percent greater than joint width, and of type recommended by sealant manufacturer to be compatible with sealant. Locate backer rod to provide for sealant depth of one-half joint width, but not less than 12 mm (1/2").
- .5 Prime joint if required, as recommended by sealant manufacturer.
- .6 Seal base of form tie holes in exposed concrete surfaces using approved sealant.
- .7 Place cementitious waterproofing in below-grade wall construction joint reglets.

3.14 Dampproofing

- .1 Apply dampproofing specified in Section 03 15 00, to entire surface of earth face of exterior and interior foundation walls with earth on one side only. Apply dampproofing from exterior grade level down to and including top surface of footing.
- .2 At temperatures above 5°C (40°F), apply approved mineral colloid asphalt emulsion in accordance with CAN/CGSB-37.3, at rate of 1 l/m² (2 gallons per 100 ft²) for each of two coats.
- .3 At temperatures of 5°C (40°F) and below, apply approved unfilled asphalt cutback in accordance with CGSB 37-GP-12Ma at rate of 1 l/m² (2 gallons per 100 ft²) for each of two coats.
- .4 Obtain Consultant's approval of dampproofing before backfilling.

3.15 External Fastening and Coring

- .1 Do not core concrete without prior written approval of Consultant.
- .2 Do not drill inserts or drive power actuated fasteners into structural concrete without prior written approval of Consultant.

3.16 Carbon Monoxide Equipment

- .1 Do not place concrete for floor slabs if carbon monoxide producing equipment has been in operation in the building or temporary enclosure during 12 hours preceding start of concreting.
- .2 Provide positive ventilation during 12 hours preceding start of concreting.
- .3 Unless directly used for concrete placing, do not operate carbon monoxide producing equipment in the building or temporary enclosure during or within 24 hours after completing finishing of any floor slab section.

3.17 Testing of Watertightness of Concrete Structures

- .1 Test in accordance with ACI 350.1-01, Tightness Testing for Environmental Engineering Concrete Structures and its Commentary.
- .2 Do not proceed with watertightness test until concrete structure is completed and concrete has attained specified strengths.

Cast-in-Place Concrete

- .3 Fill all structures to contain liquid with clean water prior to application of membrane or waterproofing and prior to placement of joint sealants. Fill tanks and channels only to design level elevations as directed by Consultant.
- .4 Leave for a minimum of 72 hours prior to testing for leakage.
- .5 Measure any loss of water or leakage for the period required by ACI 350.1.
- .6 Supply and dispose off site all water required for this purpose at Contractor's expense.
- .7 Allow for evaporation from tanks in accordance with ACI 350.1.
- .8 Where permissible, an allowable leakage shall be measured as a drop in water elevation over 24 hour period and will be determined based on actual service intended for the structure being tested. Allowable leakage for the respective structure shall be in accordance with the following table. No leakage or sweating whatsoever of the structure adjoining or forming part of the tunnels or pumphouses will be permitted. All tunnels and pumphouses shall be completely watertight. Structures shall not be backfilled until testing is complete unless otherwise permitted by Consultant.
- .9 Maximum allowable leakage for the various structures is tabulated as follows:

Item	Maximum Allowable Leakage in a 24 Hour Period
Tank walls or channel walls adjacent to or making up tunnels or pumphouses subject to external high groundwater or stored liquids	Nil (HST – NML)
Channels, clarifier, fermenter and bioreactor tanks (walls not adjacent to tunnels or pumphouses)	.10 of 1% of liquid volume (HST – 100)
- .10 Locate and repair all leaks at Contractor's expense.
- .11 Plug and make completely watertight all visible leaks in items requiring nil leakage at Contractor's expense.
- .12 Remedy all leaks in excess of maximum specified at Contractor's expense. Re-test structure at Contractor's expense after repairing until leakage is less than maximum specified.
- .13 Test each cell of multi-cell tanks individually.
- .14 Testing to conform to Chapter 2 of ACI 350.1.

3.18 Field Quality Control

- .1 Inspection and Testing Company, when appointed as specified for Source Quality Control elsewhere in this Section, shall perform sampling, inspection and testing of concrete Work at site.

Cast-in-Place Concrete

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- .2 Perform sampling, inspection and testing in accordance with CSA Standard A23.2, and to include:
 - .1 Making of standard slump tests.
 - .2 Obtaining of three (3) standard specimens for strength tests from each 100 40 m³ of concrete, or fraction thereof, of each mix design of concrete placed in any one day.
 - .3 Placing pull-out type inserts in accordance with ASTM C900-T when the temperature is likely to fall below 5°C within 48 hours after placing concrete and no provisions have been made to heat the concrete to greater than 10°C.
 - .4 Taking one additional test cylinder during cold weather concreting and cure on job site under same conditions as the concrete it represents.
 - .5 Verification that test specimens are stored within an enclosure, maintained at specified temperatures.
 - .6 Moist curing and making compression tests of each set of three specimens, one (1) at seven days and two (2) at twenty-eight days.
 - .7 Making of modulus of rupture tests at 90 days.
 - .8 Verification of air content of air-entrained concrete and sump for each set of cylinders taken.
 - .9 Verification of unit weight of semi-low density concrete by the volumetric methods, making one test for each 100 m³ (130 yd³) place.
 - .10 Samples of concrete to be taken as close to point of final deposit in form as possible, at end of pipe when pumping is used.
 - .3 Inspection and Testing Company is not authorized to revoke, relax, enlarge or release any requirements of Specifications, nor to approve or disapprove any portion of Work.
 - .4 Inspection and Testing Company is to advise placing crews to halt placing of adverse concrete immediately, and thereafter notify Contractor to reject the concrete. Execution, or lack of execution, of this request shall be recorded.
 - .5 Reject and do not place concrete with slumps greater than maximum specified, air content lower than minimum specified and concrete over 2 hours from batch time.
 - .1 Inspection and Testing of Unit Masonry Core Fill
 - .1 Clauses pertaining to inspection and testing of concrete contained in this Specification shall apply to unit masonry grout, unless noted otherwise.
 - .2 Inspection and Testing Company shall take a minimum of three (3) test cylinders, one slump test and one entrained air test for each 20 m³ placed or portion thereof for project having more than 20 m³ of grout and for each 10 m³ placed or portion thereof for project having less than 20 m³ and not less than one (1) test in any one day of grout placed.
-

Cast-in-Place Concrete

- .3 Reject and advise Contractor to not place job site-mixed grout over 1.5 hours from mixing time.
- .2 Inspection and Testing of Grout
 - .1 In accordance with ASTM C109, provide at least two (2) cube tests on all types of non-shrink grout used. Provide at least 5 tests of cement grout but maximum one (1) test per day.
- .3 Inspection and Testing of Gunite
 - .1 Take a minimum of three cores for each day's operation or 200 m³ of material placed, and test in accordance with ASTM C42.
- .4 Inspection for Tolerances:
 - .1 Confirm that concrete work meets tolerance requirements specified in paragraph 1.3.5.
 - .2 Use the elevation survey records of elevations of soffit form surfaces and finished concrete surfaces specified in Section 03 10 00 and this Section as basis for judging compliance.
 - .3 Use approved aluminium straightedge to judge compliance with specified slab finish tolerances, except use dipstick equipment where F-number tolerance is specified.
- .5 Slabs-on-Grade:
 - .1 Monitor on a random basis acceptable to Consultant, that slab is being sawcut before slab temperature starts to fall.
 - .2 Observe application of curing compound to sample slab, recording rate of application.

3.19 Cleaning

- .1 Repair, remove and clean all drips and smears resulting from the work of this Section on exposed, finished surfaces or surfaces to be subsequently finished.
- .2 Hose down sandblasted surfaces. Brush thoroughly with a stiff broom to remove all dust and loose particles.
- .3 Remove from building site excess and waste materials, mock-up panels, test areas, and debris resulting from Work of this Section. Leave premises in a condition acceptable to Consultant before completion of Work.

3.20 Defective Work

- .1 Variations in excess of specified tolerances, failure of materials or workmanship, and marked and disfigured surfaces will be considered defective Work performed by this Section.

Cast-in-Place Concrete

- .2 Replace or modify concrete that is out of place, or does not conform to lines, detail or grade as directed by Consultant.
- .3 Replace or repair defectively placed or finished concrete as directed by Consultant.
- .4 Contract shall pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work is deficient. Cost for additional inspection, testing, review and redesign to be deducted from Contract Value.

END OF SECTION

Concrete Floor Finishing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Concrete floor finishing, including:
 - .1 Penetrating liquid concrete floor treatment, chemically reactive, standard stay-in-place formula; S-CONC.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Reports:
 - .1 Submit log records of measurements for f-number concrete finish tolerance.
 - .2 Submit log records for straightedge concrete finish tolerances.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*:
 - .1 Has adequate equipment and skilled workers to perform the work expeditiously.
 - .2 Has successfully completed installations similar to that specified.

1.4 Field Conditions

- .1 Perform work only when environmental conditions are as specified in Section 03 30 00.

PART 2 - PRODUCTS

2.1 Materials

- .1 S-CONC; Penetrating liquid concrete floor treatment, chemically reactive, standard stay-in-place formula:
 - .1 Water-based, chemically reactive liquid densifier and chemical hardening compound: one-component liquid sodium or lithium silicate surface hardener. Odourless, colourless, biodegradable, VOC compliant and reacts chemically to produce a hard, dust-free finish.
 - .2 Acceptable *Products*:
 - .1 Mapei 'Mapecrete Hard LI'.
 - .2 Sika Canada Inc. 'Sikafloor 3S'.

Concrete Floor Finishing

.3 Substitutions: in accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Concrete Slab Finishing

.1 General:

- .1 Comply with concrete slab surface finishing tolerances schedule specified in this section.
- .2 Strike off concrete level to screeds leaving no low spots. If vibrators are used on straightedge, ensure that concrete is not over-vibrated causing segregation and collection of water and fines on the surface.
- .3 Smooth concrete to an even plane with a darby or bull float, and leave until bleed water and water sheen has disappeared.
- .4 Proceed with finishing only when concrete has hardened sufficiently.
- .5 Finish exposed edges of concrete surfaces smooth with an edging tool, with slightly round exposed corners.
- .6 Finish concrete surface with power float or with metal hand floats in areas inaccessible to power floats. Floating shall embed large aggregate below surface, consolidate mortar at surface, with even planes, without humps or depressions, remove marks from edging, and prepare surface for further specified finishing. Do not bring water and fine material to surface by overworking.
- .7 Steel trowel floated surface with power trowels or hand trowels in areas inaccessible to power trowels. Proceed with trowelling only when there is no sheen on surface. Repeat trowelling until surface is brought to approved finish. Allow sufficient time between trowelling for additional set of concrete.
- .8 Rerun tooled edges following finishing of surfaces.
- .9 Finish floor surfaces level, dense, with no aggregate showing, and free of blemishes and crazing.
- .2 Scratch finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 6 mm (1/4") in 1 direction.
 - .1 Apply scratch finish to surfaces to receive concrete floor toppings.
 - .2 Apply scratch finish to surfaces to thick set mortar setting beds for bonded floor finishes at depressed slab locations.
- .3 Float finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - .1 Apply float finish to concrete surfaces to receive trowel finishes and membrane finishes.

Concrete Floor Finishing

- .4 Trowel finish: After applying float finish, apply first trowelling and consolidate concrete by hand or power-driven trowel. Continue trowelling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - .1 Apply trowel finish to surfaces unless otherwise indicated or scheduled.
 - .2 Apply trowel finish to surfaces to be covered with access flooring.
 - .3 Apply single pass trowel finish to concrete deck surfaces to receive thin traffic coating materials and exposed slabs in parking structures in accordance with CSA S413-21.
- .5 Trowel and fine-broom finish: While concrete is still plastic, slightly scarify surface with a fine broom.
 - .1 Apply trowel and fine-broom finish to other hard surface tile to be installed by thin-set method.
- .6 Broom finish: Immediately after float finishing, slightly roughen trafficked surface by brooming with fibre-bristle broom perpendicular to main traffic route. Coordinate required final finish with *Consultant* before application.
 - .1 Apply broom finish to exterior concrete platforms, steps, and ramps.

3.2 Concrete Slab Surface Finishing Tolerances

- .1 Finish slabs to receive waterproofing membrane materials to provide positive slope to water outlet without ponding.
- .2 Concrete tolerances: Straightedge in accordance with CAN/CSA A23.1/A23.2-14.
 - .1 Premium grade: For exposed concrete and concrete floor scheduled or indicated to receive premium floor finishes: Place and steel trowel finish surface of concrete floors to within ± 3.2 mm in 3000 mm ($\pm 1/8$ in 10 ft) as described in CAN/CSA A23.1/A23.2-14. Floor finish shall be smooth and free of trowel marks or other defects which telegraph through to finished flooring when viewed from a distance range of within 1830 mm (6 ft).
 - .2 Independent testing company may measure for straightedge tolerances in accordance with CAN/CSA A23.1/A23.2-14, in accordance with Section 01 45 00. Provide 4 *Working Days* notice in advance of concrete flooring placement and finishing.
- .3 Concrete tolerances: F-number in accordance with CAN/CSA A23.1/A23.2-14.
 - .1 Level surface to the following minimum tolerance. Grind smooth surface defects that would be visible or telegraph through applied floor finishing system.
 - .1 Class B: $F_F 25 - F_L 20$.
 - .2 Measure f-number finish tolerance requirements in accordance with CAN/CSA A23.1/A23.2-14.

Concrete Floor Finishing

- .3 Independent testing company may measure for *F*-number finish tolerance requirements in accordance with CAN/CSA A23.1/A23.2-14, in accordance with Section 01 45 00. Provide 4 *Working Days* notice in advance of concrete flooring placement and finishing.
- .4 Concrete tolerances; for sloped concrete floor slab assemblies:
 - .1 Provide minimum of 2% slope from the corner of each drain area in order for water to drain freely with minimal assistance.

3.3 Penetrating Liquid Concrete Floor Treatment; Chemically Reactive

- .1 Install in accordance with manufacturer's written requirements.

3.4 Patching and Refinishing

- .1 Before completion of the *Work*, patch and refinish defective surfaces to match surrounding areas with no discernible variation in appearance.

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

3.6 Protection

- .1 Protect finished concrete floor areas from abrasion traffic, and from damage caused by spillage of oil or other deleterious materials.

END OF SECTION

Architectural Precast Concrete Fabrications

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Precast concrete Base fabrications to profiles as indicated.
 - .2 Steel inserts and anchors for precast installation.

1.2 References

- .1 Definitions:
 - .1 Hairline cracks:
 - .1 Surface cracks of minute width, visible but not measurable by ordinary means.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint.
- .4 Samples:
 - .1 Submit precast concrete samples, in sizes as directed by the *Consultant* of the specified finish for review by the *Consultant*.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*:
 - .1 Has proven experience in the design and manufacture of precast concrete.
 - .2 Has adequate finances, equipment, plant and skilled personnel to expeditiously detail, fabricate and install the work of this section as required by the *Contract Documents*.
 - .2 Manufacturer:
 - .1 Manufacturer shall be qualified in accordance with CSA A23.4-16.
 - .2 The manufacturer shall be responsible for the design, connections, and installation of the precast concrete units.

Architectural Precast Concrete Fabrications

1.5 Delivery, Storage, and Handling

- .1 Design and cast lifting devices into the units to ensure that they will be safely and efficiently handled. Lifting devices shall be so arranged that they do not have to be removed or, if they must be removed, they shall be arranged so that they are readily filled.
- .2 Stack units on properly cushioned supports to protect the edges.
- .3 Do not permit units to contact earth or other staining influences or to rest on corners.
- .4 Protect stockpiles against inclement weather.
- .5 Protect holes and reglets against water and ice in freezing weather.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design and construct precast concrete work in accordance with CSA A23.4-16.
- .2 Slope top surfaces of exterior precast minimum 2%.

2.2 Materials

- .1 Precast concrete units:
 - .1 Cement, water reducer, air entrainment, sand, aggregates, water admixture: to CSA A23.4-16 and CAN/CSA A23.1/A23.2-09.
 - .2 Aggregate: in conformance with CSA-A23.1-09 and shall be tested for soundness prior to manufacture in accordance with CSA A23.4-16.
 - .3 Sand: Silica or sandstone sand of approved source, as selected by *Consultant*.
 - .4 Admixture: in accordance with CSA-A23.1-09. Introduce admixtures to concrete at time of batching in accordance with the manufacturer's recommendations. Admixtures shall be subject to the approval of the *Consultant*.
 - .5 Reinforcing steel: billet steel bars conforming to CAN/CSA G30.18-09. Reinforcing larger than 6 mm (1/4") diameter shall be deformed bars conforming to the same standard. Welded wire mesh shall conform to ASTM A1064 / A1064M-17. Galvanize reinforcing with less than 25 mm (1") cover.
 - .6 Metal precast anchor and hardware finish:
 - .1 For metal anchors and hardware located at or below finished grade: Stainless steel Type 304/316.
 - .2 For metal anchors and hardware located exterior to the air barrier membrane: Stainless steel Type 304/316
 - .7 Water: in accordance with CSA-A23.1-09.
 - .8 Concrete: minimum compressive strength of 35 MPa at twenty eight (28) days. Precast concrete units shall contain entrained air controlled at 5% minimum.

Architectural Precast Concrete Fabrications

- .9 Forms: constructed of approved concrete, steel or fibreglass reinforced plastic or high density overlaid plywood conforming to CSA O121-08 to obtain a high quality of the finish.
- .10 Stainless steel setting rods, sized as required to receive parapet caps and sills.
- .11 Non-shrink grout and setting mortar: Non-shrink 2-component setting type epoxy mortar as manufactured by Sika, WR Meadows, Master Builders Solutions, or approved alternative.
- .2 Finish on exposed surfaces of precast concrete shall be grey or white, to *Consultant's* selection, with smooth sandblast finish and as follows:
 - .1 Colour and Texture: to later selection by *Consultant*.

PART 3- EXECUTION

3.1 Installation

- .1 Erect precast concrete units in accordance with CSA A23.4-16 and this Standard shall apply to precast concrete units required under this section.
- .2 Set work plumb, true and square with joints parallel and uniform. Vertical and horizontal joints 12.7 mm (1/2") wide maximum as detailed.
- .3 Where tolerances will interfere with work of other Sections that will force other work to be out of plumb or deviate from straight lines shown on drawings, *Provide* remedial work for this defect at no additional cost to the *Owner*.
- .4 Set dowels into full contact with non-shrink grout in accordance with engineered shop drawings.
- .5 Set precast into full contact with non-shrink mortar in accordance with engineered shop drawings.
- .6 Joints between precast and between precast and adjacent materials: Apply sealant in accordance with Section 07 92 00.
- .7 Supply adequate information on handling and installation methods.

3.2 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Rejection of work:
 - .1 Concrete units containing concrete which have failed to meet required strength requirements will be rejected. Units fabricated out-of-square, out-of-dimension, without proper reinforcement, proper opening or inserts, shall be rejected.
 - .2 Damaged, chipped, rust stained, and discoloured panels shall be replaced, patched or refinished with original face matrix materials.
 - .3 Except for hairline cracks, units which have become cracked or broken will be rejected.

Architectural Precast Concrete Fabrications

3.3 Adjusting and Cleaning

- .1 Remove, as work progresses, excess or foreign materials that would set on or become difficult to remove from finished surface.
- .2 At completion, clean exposed surfaces of precast units. Remove dirt and other extraneous matter. Do not use acidic cleaners.

END OF SECTION

Masonry Procedures

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Masonry procedures for masonry work.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in masonry assemblies.
- .3 Shop drawings:
 - .1 Submit shop drawings for masonry unit wall assemblies indicating:
 - .1 Proposed locations of movement (control) joints.
 - .2 Types of masonry units, grade, texture, typical dimensions, colours, special shapes and shape dimensions.
 - .3 Layout/coursing for each type of masonry unit. Units are not to be cut without approval of *Consultant*. Layout using full brick masonry units.
 - .2 Submit engineered shop drawings, complete with assurance letters by Supporting Registered Professionals, for the following:
 - .1 Non-axial-load bearing masonry assemblies (post disaster applications).
 - .2 Masonry reinforcement.
 - .3 Masonry ties and connectors.
 - .4 Masonry unit wall assemblies for walls that are to act as guards.
- .4 Samples:
 - .1 2 of each type of brick masonry unit specified.
 - .2 2 of each type of concrete masonry unit specified.
 - .3 1 of each type of masonry accessory specified.
 - .4 1 of each type of masonry reinforcement and tie proposed for use.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Installers:

Masonry Procedures

- .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval of *Product* manufacturers.

1.5 Delivery, Storage, and Handling

- .1 Deliver materials to the *Place of the Work* in dry condition.
- .2 Keep materials dry until use.
- .3 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.6 Field Conditions

- .1 Cold weather construction requirements:

- .1 Comply with requirements of CAN/CSA A371-14, and as follows:

Air Temperature, °C	General requirements during construction
0 to 4	Sand or mixing water shall be heated to a minimum of 20°C and a maximum of 70°C.
-4 to 0	Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C.
-7 to -4	(1) Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C. (2) Source heat shall be provided on both sides of the walls under construction. (3) Windbreaks shall be employed when the wind speed exceeds 25 km/h.
-7 and below	(1) Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C. (2) Enclosures and supplementary heat shall be provided to maintain an air temperature above 0°C. (3) The temperature of the unit when laid shall be not less than 7°C.

- .2 Grout shall be placed in masonry at a minimum temperature of 20°C and a maximum temperature of 50°C.
- .3 Mortar temperature shall not exceed 50°C to avoid flash set.
- .4 Maintain dry beds for masonry and use dry masonry units only. Do not wet masonry units in winter.
- .2 Cold weather protection requirements:
- .1 Comply with requirements of CAN/CSA A371-14, and provide protection requirements for completed masonry or sections not in progress shall be as follows:

Mean daily air temperature, °C	Protection
0 to 4	Masonry shall be protected from rain or snow for 48 h
-4 to 0	Masonry shall be completely covered for 48 h
-7 to -4	Masonry shall be completely covered with insulating blankets for 48 h
-7 and below	The masonry temperature shall be maintained above 0 °C for 48 h by enclosure and supplementary heat

Masonry Procedures

.3 Hot weather construction requirements:

.1 Comply with requirements of CAN/CSA A371-14, and as follows:

.1 The spreading of mortar beds shall be limited to 1.2 m, and the masonry units shall be set within 1 minute of spreading the mortar, when the air temperature is above:

.1 38°C; or

.2 32°C, with a wind velocity greater than 13 km/h.

.2 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

1.7 Warranty

.1 Warrant work of this section in accordance with Section 01 78 36.

PART 2- PRODUCTS

2.1 Materials

.1 Mortar and grout for masonry: in accordance with Section 04 05 13.

.2 Masonry reinforcement and connectors: in accordance with Section 04 05 19.

.3 Masonry accessories: in accordance with Section 04 05 23.

.4 Brick masonry units: in accordance with Section 04 21 00.

.5 Concrete masonry units: in accordance with Section 04 22 00.

PART 3 - EXECUTION

3.1 Workmanship

.1 Build masonry plumb, level, and true to line, with vertical joints in proper alignment. Lay masonry to tolerances specified in CAN/CSA A371-14.

.2 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

.3 Masonry mortar and grout work: CAN/CSA A179-14 except where specified otherwise.

.4 Masonry work: CSA S304-14, CAN/CSA A370-14, and CAN/CSA A371-14 except where specified otherwise.

3.2 General Erection Tolerances

.1 Lay masonry units with required mortar joint thickness specified below, not to exceed 12.7 mm (1/2").

.2 Construction tolerances:

.1 Maximum variation from plumb in vertical lines and surfaces of columns, walls and arrises:

Masonry Procedures

- .1 6.4 mm (1/4") in 3 m (10').
- .2 9.6 mm (3/8") in a storey height not to exceed 6 m (20').
- .3 12.7 mm (1/2") in 12 m (40') or more.
- .2 Maximum variation from plumb for external corners, expansion joints and other conspicuous lines:
 - .1 6.4 mm (1/4") in any story or 6 m (20') maximum.
 - .2 12.7 mm (1/2") in 12 m (40') or more.
- .3 Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
 - .1 6.4 mm (1/4") in any bay or 6 m (20').
 - .2 12.7 mm (1/2") in 12 m (40') or more.
- .4 Maximum variation from plan location of related portions of columns, walls and partitions:
 - .1 12.7 mm (1/2") in any bay or 6 m (20').
 - .2 19 mm (3/4") in 12 m (40') or more.
- .5 Maximum variation in cross-sectional dimensions of columns and thicknesses of walls from dimensions shown on drawings:
 - .1 Minus 6.4 mm (1/4").
 - .2 Plus 12.7 mm (1/2").
- .6 Where masonry surfaces serves as substrate for thin-set tile and direct applied and insulated finish coatings, build to tolerance of 3.2 mm in 2440 mm (1/8" in any 8') under a straight edge.

3.3 Laying Masonry Units

- .1 Coursing design:
 - .1 Brick masonry units:
 - .1 To match existing coursing design.
 - .2 Concrete masonry units:
 - .1 Fifty percent running bond.
- .2 Installation and materials shall meet or exceed that of accepted samples.
- .3 Units shall be cut only upon acceptance of *Consultant*. Walls are to be laid-up with full size masonry units.
- .4 Keep cavity space at cavity and/or veneer walls clear of mortar droppings and debris.
- .5 Remove loose and foreign materials from supporting bed surfaces to ensure bonding.
- .6 Do not tooth at wall terminations. Rake back 1/2 unit length where stop-off occurs in horizontal run of masonry.

Masonry Procedures

- .7 Do not install masonry units with face or faces exhibiting chips, cracks, blemishes, texture variation, and other imperfections detracting from appearance when viewed from distance of 4600 mm (15').
- .8 Do not install defective, cracked, and broken masonry units.
- .9 Mixing and blending: Mix units from a minimum of 3 pallets to ensure uniform blend of colour and texture and comply with manufacturer's recommended installation requirements. Distribute masonry units of varying textures to avoid spotty appearance over wall surfaces exposed to view. Do not use units which contrast too greatly with overall range.
- .10 Maintain bracing of walls and piers continuously during construction until structure provides support.
- .11 Locate bearings and piers as indicated. *Provide* solid masonry units at bearings. Grout under bearing plates installed on masonry with non-shrink grout.
- .12 Extend masonry and partitions to deck, slab or structural members, as applicable, except where otherwise noted in the *Contract Documents*. Incorporate both lateral support and deflection space at termination of walls as required by this section.
- .13 Grouted reinforced masonry: incorporate reinforcing steel and construct masonry to indicated requirements.
- .14 Lay masonry level, true to line, square, plumb, and as indicated. Lay masonry courses in vertical alignment to ensure vertical joints align for full height of masonry and full height of building face.
- .15 Lay masonry in full bed of mortar, properly jointed with other work. Buttering corners of joints, and deep or excessive furrowing of mortar joints are not permitted.
- .16 Fully bond intersections, and external corners.
- .17 Do not adjust masonry units after placement. Where resetting of masonry is required, remove units, clean and reset in new mortar.
- .18 Cut masonry around obstructions, leaving maximum joint size as specified in this section (below).
- .19 Build chases, do not cut them.
- .20 Lay hollow concrete masonry units so that shells rest and align.
- .21 Exposed cuts shall be made clean and true with a suitable masonry saw.

3.4 Exposed Masonry

- .1 Do not lay chipped, cracked, blemished, and otherwise damaged units whether exposed or concealed.
- .2 Do not lay concrete masonry units that will appear smooth or slick where exposed to view, whether painted or not finished.
- .3 Remove chipped, cracked, and otherwise damaged units and replace with undamaged units.

Masonry Procedures

- .4 Maintain and control water-to-cement ratio, rate of hydration, environmental conditions, tooling of the mortar joints, and cleaning procedures, to produce masonry of uniform appearance matching accepted mock-up.

3.5 Jointing

- .1 Form tooled mortar joints whenever exposed to view, and behind cabinets, fitments, and wall accessories. Tool when mortar is thumb-print hard by tools having long bearing surface to avoid uneven depressions. Close cracks and crevices.
- .2 Tool with non-staining pointing tool to provide smooth, compressed, uniformly formed joints as follows:
 - .1 For exposed brick masonry:
 - .1 To match existing.
 - .2 For exposed concrete unit masonry:
 - .1 Concave.
 - .3 For concealed masonry: strike flush joints concealed in walls and joints in walls to receive plaster, stucco, tile, insulation, resilient bases, or other applied material except paint or similar thin finish coating. Ensure that no mortar protrudes from joints on wall surfaces to receive materials and coatings.
 - .4 Joint thickness:
 - .1 Maintain mortar joint thickness of 10 mm (3/8"), unless otherwise specified or indicated.
 - .2 At masonry cut around obstructions: maximum joint size of 13 mm (1/2").
- .3 Make joints of uniform thickness with vertical joints in alignment.
- .4 Trowel point joints in unparged masonry at below grade locations in contact with earth.
- .5 Form reglets where indicated for metal flashing in masonry.
- .6 Remove loose or defective mortar when masonry is removed and replace.
- .7 Rake out joints at junctions of masonry with concrete walls and columns, and at intersection of masonry walls and partitions where joint reinforcement is installed. These joints shall be sealed in accordance with Section 07 92 00.

3.6 Built-In Work

- .1 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
- .2 Coordinate and cooperate in the provisions for setting, anchorage and alignment of built-in work.
- .3 Metal door frames:
 - .1 Build masonry around metal door frames.
 - .2 Ensure that anchors are secured solidly, and that frames are true and plumb.

Masonry Procedures

- .3 Fill back void of frames with Type N or S mortar unless otherwise indicated.
- .4 Protect frame with protective covering and leave no mortar on exposed frame faces.

3.7 Reinforced Masonry

- .1 Conform to requirements of CAN/CSA A371-14.
- .2 Grout beneath bearing plates: Fill voids beneath steel bases bearing on masonry with approved non-shrink grout having minimum compressive strength at 28 days cure time of 35 MPa. In addition, use non-ferrous grout where grout is exposed to view, in-service moisture conditions, and weather.
- .3 Reinforced block lintels:
 - .1 Install reinforced block lintels over doorways, other openings and recesses as indicated.
 - .2 Support masonry units of reinforced block lintels built in place. *Provide* a level platform, true to the proper elevation and of sufficient strength to support the load without visible deflection. Maintain supports in place for a minimum of 7 days and for a period sufficient to permit the concrete to cure and gain sufficient strength to safely support loads.
 - .3 Lay masonry units with full mortar coverage on abutting edges with joints shoved tight. Where masonry construction is continued above the lintel, place the first course of masonry units on the lintel in full mortar bed.
 - .4 Fill voids of masonry units that form the fill depth of lintel beams at one time per beam, with grout having minimum compressive strength at 28 days curing time of minimum 35 MPa.

3.8 Provision for Movement

- .1 Deflection space:
 - .1 Incorporate deflection space between tops of non-load-bearing walls/partitions and structure to prevent transference of structural loads to masonry.
 - .1 Exterior masonry wall deflection space: 25 mm (1").
 - .2 Interior masonry partition deflection space: 38 mm (1-1/2")
- .2 Coordinate work of this section with installation of lateral supports.

3.9 Loose Lintels

- .1 Loose lintels: Install loose lintels as required to suit required openings. Set and level lintels, centred over opening width, on a 20 mil PVC slip-sheet membrane, placed over bed or mortar. Allow suitable movement joint at ends of lintels for expansion and contraction movement at exterior lintels.

Masonry Procedures

3.10 Lateral Supports

- .1 In addition to requirements of *Contract Documents*, *Provide* horizontal and vertical wall and partition lateral support anchors in accordance with CAN/CSA A370-14.

3.11 Movement (Control) Joints

- .1 For masonry without openings, space vertical movement joints at no more than 7620 mm (25') on centre.
- .2 For masonry with multiple openings, provide symmetrical placement of movement joints and reduced spacing of no more than 6096 mm (20 ft) on center.
- .3 Place movement joints at changes in wall direction, changes in building heights, at door and window locations where necessary and directed, at major changes in thickness of wall.
- .4 Extend movement joints to top of masonry, including parapets.
- .5 Review and coordinate movement joint locations with the *Consultant* prior to installation of masonry.

3.12 Temporary Bracing

- .1 *Provide* adequate temporary bracing to masonry walls until floor and roof decks are installed and can develop adequate diaphragm action to brace walls.

3.13 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and perform field control tests in accordance with CSA S304-14.

3.14 Adjusting and Cleaning

- .1 Protect masonry and adjacent work from damage from cleaning work.
- .2 Clean masonry in accordance with masonry manufacturer's written requirements. Remove masonry and install new masonry, if masonry is damaged by cleaning work.
- .3 Use proprietary PH-neutral cleaning solution with water as approved by manufacturer of masonry units in accordance with manufacturer's written directions.
- .4 Test cleaning agent and procedures by cleaning small, inconspicuous sample location prior to commencement of overall cleaning work. Review cleaning test area with *Consultant* and obtain acceptance in writing prior to cleaning remainder of areas requiring cleaning.
- .5 Soak wall with clean water and flush off loose dirt and mortar.
- .6 Apply specified cleaning agent in accordance with the manufacturer's direction, working from top to bottom.
- .7 Rinse areas thoroughly with clean water to remove cleaning solutions, dirt, and mortar residue.

Masonry Procedures

- .8 Remove mortar from exposed masonry face immediately after pointing and prior to full set to avoid mortar staining of masonry units. Remove efflorescence and mortar deposits from surfaces to receive coatings and surfaces which are exposed to view. Remove masonry and install new masonry, if mortar staining cannot be removed without damaging masonry work.
- .9 Remove mortar droppings from flashings and other materials immediately to prevent damage and discolouration.

3.15 Protection

- .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .2 Protect other materials and finishes from contamination by mortar droppings.
- .3 *Provide* temporary bracing of masonry work during and after erection until permanent lateral support is in place.

END OF SECTION

Mortar and Grout for Masonry

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Mortar and grout for masonry work.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00 and Section 04 05 00.
- .2 Test and evaluation reports:
 - .1 Submit test results confirming compliance of aggregates with CAN/CSA A179-14.

1.3 Delivery, Storage, and Handling

- .1 Protect cementitious materials against moisture.
- .2 Prevent contamination by foreign materials, and freezing.

PART 2 - PRODUCTS

2.1 Materials

- .1 Mortar and grout: Comply with CAN/CSA A179-14.
- .2 Portland cement: in accordance with CAN/CSA A3001-13, GU (Type 10). For exposed mortar, maintain uniformity of cement manufacturer and batch for colour uniformity.
- .3 Hydrated lime: in accordance with ASTM C207-18, Type S.
- .4 Sand: in accordance with CAN/CSA A179-14.

2.2 Material Source

- .1 Mortar and grout shall be factory prepared premix including sand and colour. Site mixing of bags and sand will not be accepted. Use mortar and grout as supplied by silo batched systems.
- .2 Maintain uniformity of mortar material manufacturers, mortar materials and source of aggregate throughout the *Work*.

2.3 Mortar Types

- .1 Mortar for exterior masonry above grade; ready (silo) mixed:
 - .1 Loadbearing: Type S.
 - .2 Non-loadbearing: Type N.
 - .3 Mortar for exterior exposed masonry veneer: Type N, Portland Cement/Lime/Sand mix.
- .2 Mortar; ready mixed for foundation walls; at or below grade: Type S.
- .3 Mortar for interior masonry; ready (silo) mixed:

Mortar and Grout for Masonry

- .1 Loadbearing: Type S.
- .2 Non-loadbearing: Type N.

2.4 Mortar Colour

- .1 Mortar colour; for use as indicated, ready (silo) mixed mortar:
 - .1 Control mortar materials and workmanship to produce uniform grey colour (non-pigmented).

2.5 Grout Types

- .1 Grout for masonry: Grout in accordance with CAN/CSA A179-14.
 - .1 Compressive strength in accordance with CAN/CSA A179-14 except where indicated otherwise and except as follows:
 - .1 Beneath bearing plates: 35 MPa.
 - .2 Slump: 200 mm (8") unless otherwise indicated.
- .2 Grout for hollow metal frames: Fine grout in accordance with CAN/CSA A179-14.
 - .1 Compressive strength: 15 MPa minimum.

PART 3 - EXECUTION

3.1 Masonry Procedures

- .1 Masonry procedures shall be in accordance with Section 04 05 00 as supplemented herein.
- .2 Comply with CAN/CSA A179-14, except where indicated otherwise.

3.2 Measurement and Mixing

- .1 Mix mortars and grout as specified in CAN/CSA A179-14 and pre-batch at factory. Use only dry aggregate. Test for bulking to determine accurate proportioning.
- .2 Adjust water in mortar mix to suit absorption rates of masonry units.
- .3 Concrete grout: mix as required to achieve specified compressive strength.

3.3 Grout

- .1 Place and grout reinforcing and bearing in accordance with Section 04 05 00, CAN/CSA A371-14, and as indicated.

3.4 Field Quality Control

- .1 Field tests and inspections:
 - .1 *Provide* mortar for strength testing in accordance with CAN/CSA A179-14 and Section 01 45 00.

Mortar and Grout for Masonry

3.5 Protection

- .1 *Provide* protection where required at mixing areas to prevent damage attributed to materials of this section.

END OF SECTION

Masonry Reinforcement and Connectors

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Masonry reinforcing and anchorage.
 - .2 Connectors for anchorage of masonry veneer to the following support assemblies:
 - .1 Concrete unit masonry.
 - .2 Concrete.
 - .3 Horizontal reinforcing for masonry block wall and partition assemblies.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00 and Section 04 05 00.

PART 2 - PRODUCTS

2.1 Materials

- .1 General: in accordance with building code and CAN/CSA A370-14 and OBC Table 4.1.8.18.
- .2 Corrosion protection; metal materials: in accordance with building code and CAN/CSA A370-14:
 - .1 For metal located interior to air barrier location: Hot dipped after fabrication in accordance with ASTM A1064/A1064-22, and ASTM A153/A153M-09 Class B2 (457 g/m²), mill galvanized.
 - .2 For metal located exterior to the air barrier membrane: Stainless steel Type 304/316.
- .3 Joint reinforcement:
 - .1 Acceptable manufacturers:
 - .1 Blok-Lok.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Exterior wall assemblies: 4.75 mm (3/16") wire, welded rod, ladder design unless otherwise indicated.
 - .3 Interior wall assemblies: 9 gauge mill galvanized wire ladder reinforcement.

PART 3- EXECUTION

3.1 Masonry Reinforcing, Ties, and Connectors - Engineered Applications

- .1 Install masonry reinforcing, ties, and connectors in accordance with engineered design and CAN/CSA A371-14.

Masonry Reinforcement and Connectors

3.2 Movement (Control) Joints

- .1 Installation requirements in accordance with Section 04 05 00 and as supplemented herein.
- .2 Stop reinforcing 25 mm (1") short of each side of movement joints unless otherwise indicated.

3.3 Horizontal Reinforcing

- .1 Joint reinforcement:
 - .1 Install horizontal joint reinforcement in cavity walls, solid walls, and partitions in accordance with CAN/CSA A371-14 and as indicated in the *Contract Documents*, the more stringent requirements shall govern.
 - .2 Place reinforcement continuously in horizontal joints at vertical spacing not exceeding 400 mm (16"), beginning with course 400 mm (16") above bearing, unless otherwise indicated.
 - .3 Do not carry reinforcement through intersections where lateral support anchors are installed, at intersections of walls and partitions with solid piers and at block movement joints.
 - .4 Reinforcement shall be lapped 300 mm (12"), minimum, with laps staggered 750 mm (30"), minimum, from course to course. Any cross wires in the lap length of the lapped reinforcement shall be removed.

3.4 Masonry Veneer Connectors

- .1 Tie masonry veneer to structural backing in accordance with CAN/CSA A179-14, CSA S304-14, CAN/CSA A370-14, CAN/CSA A371-14, and as indicated on engineered shop drawings.

3.5 Reinforced Masonry

- .1 Reinforce masonry lintels and bond beams as indicated. Make joints in lintels and bond beams to match adjacent walls.
- .2 Reinforce masonry walls as indicated on the structural drawings.
- .3 Place and grout reinforcing in accordance with CSA S304-14. Use concrete of 20 MPa strength in accordance with Section 03 30 00.
- .4 *Provide* minimum 150 mm (6") bearing on supports for lintels.
- .5 Place 100% solid block at each jamb under lintels.

3.6 Bolts and Anchors

- .1 Embed bolts and anchors solidly in mortar or grout to develop maximum resistance to design forces.

Masonry Reinforcement and Connectors

3.7 Lateral Support and Anchorage

- .1 Install lateral support and anchorage in accordance with CAN/CSA A370-14 and as indicated on the structural drawings.

END OF SECTION

Masonry Accessories

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Movement (control) joint filler at masonry veneer.
 - .2 Weep vents at cavity masonry veneer.
 - .3 Cavity drainage material at exterior masonry cavity walls.
 - .4 Masonry through wall membrane flashing at exterior masonry wall assemblies.
 - .5 Metal flashing at masonry wall assemblies.
 - .6 Deflection space filler at top of non-fire rated masonry partitions.
 - .7 Deflection space filler at top of fire-rated masonry partitions.
 - .8 Preformed movement (control) joint filler at concrete walls/partition assemblies.
 - .9 Slip-sheet membrane for steel lintel bearing over masonry to allow lintel movement (thermal expansion/contraction).

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00 and Section 04 05 00.

PART 2 - PRODUCTS

2.1 Materials

- .1 Movement (control) joint filler at masonry veneer: sealant and backer rod in accordance with Section 07 92 00.
- .2 Weep vents: Full height of masonry unit, designed to keep weep hole open for passage of air and water, UV stabilized polypropylene.
 - .2 Size: Height of head joint x depth of masonry unit x thickness of mortar joint.
 - .3 Colour: to later selection by *Consultant* from manufacturer's full range.
 - .4 Acceptable *Product*:
 - .1 Advanced Building Products, Inc. 'Mortar Maze Weep Vents.'
 - .2 Blok-Lok Limited 'Cell-Vent'.
 - .3 Mortar Net Solutions 'WeepVent'.
 - .4 Wire-Bond 'Cell-Vent'.
- .3 Cavity drainage material: Free-draining mesh made from polymer strands or extruded polypropylene formed cavity units to suit cavity depth, that will not degrade within the wall cavity.
 - .1 Acceptable *Products*: Subject to compliance with requirements, *Provide* one of the following:

Masonry Accessories

- .1 Advanced Building Products Inc. 'Mortar Break DT'.
- .2 Blok-Lok 'Mortar Trap'.
- .3 Mortar Net Solutions 'MortarNet'.
- .4 Wire-Bond 'Cavity Net DT'.
- .4 Masonry through wall flashing:
 - .1 Sheet membrane:
 - .1 Single source responsibility: Components required for complete air barrier system and through wall flashing membrane behind the opaque wall assemblies to be obtained from single manufacturer. Coordinate with Section 07 27 00.
 - .2 Primer: as per manufacturer's installation requirements.
 - .3 SBS rubberized asphalt compound integrally laminated to cross laminated polyethylene film.
 - .4 Overall thickness: 1 mm (40 mils).
 - .5 Film thickness: 0.203 mm (8 mils).
 - .6 Service temperature: -40 °C to 70 °C.
 - .7 Acceptable *Products*:
 - .1 Carlisle Coatings & Waterproofing: CCW-705 TWF.
 - .2 GCP Applied Technologies 'Perm-A-Barrier Wall Flashing'.
 - .3 Henry Company 'Bakor Blueskin TWF'.
 - .4 Soprema 'Soprasedal Stick 130-S'.
 - .5 W.R. Meadows 'Air-Shield Thru-Wall Flashing'.
- .5 Metal flashing:
 - .1 0.45 mm (26 gauge) minimum thickness, commercial quality in accordance with ASTM A653/A653M-13 with Z275 designation zinc coating, finish: in accordance with Section 07 62 00.
- .6 Cavity firestopping materials:
 - .1 Mineral type in accordance with Section 07 84 00.
- .7 Deflection space filler (non-fire rated walls):
 - .1 Acceptable *Product*:
 - .1 Johns Manville 'MinWool Sound Attenuation Fire Batts'.
 - .2 Rockwool 'AFB'.
- .8 Deflection space filler (fire rated walls):
 - .1 Mineral type in accordance with Section 07 84 00.
- .9 Slip-sheet flashing membrane (for loose lintel bearing locations):

Masonry Accessories

- .1 Minimum 0.5 mm (0.020") thick, PVC membrane, low temperature flexible to 40°C below zero.
- .2 Acceptable *Products*:
 - .1 Blok-Lok 'Flex-Flash'.
 - .2 Lexcor F20.

PART 3 - EXECUTION

3.1 Masonry Installation and Procedures

- .1 Masonry installation and procedures shall be in accordance with Section 04 05 00, as supplemented herein.

3.2 Movement (Control) Joints

- .1 Installation requirements in accordance with Section 04 05 00 and as supplemented herein.
- .2 Keep movement joints clear for application of joint sealants.
- .3 Install movement joint filler in accordance with product manufacturer's written requirements.

3.3 Vents

- .1 Install weep vents in vertical joints at bottom of walls immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at uniform and consistent horizontal spacing not exceeding 610 mm (24"). Do not locate vents within 610 mm (24") adjacent to corners of buildings.

3.4 Masonry Flashing

- .1 General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- .2 Install flashing as follows unless otherwise indicated:
 - .1 Install flashings in masonry in accordance with CAN/CSA A371-14.
 - .2 Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal laps and penetrations in flashing watertight in accordance with manufacturer's installation requirements.
 - .3 At lintels and shelf angles, extend flashing a minimum of 150 mm (6") into masonry at each end. At heads and sills, extend flashing minimum of 150 mm (6") at ends and turn up 50 mm (2") minimum to form end dams.
 - .4 Flashings shall be installed to shed water in masonry cavity to exterior. Make flashings watertight.

Masonry Accessories

- .5 Install masonry flashing to perform as dampproof course in walls that extend below grade except walls which are not exposed to moisture or protected by moisture retarding materials. Locate more less than 150 mm (6") above finished grade.

3.5 Cavity Firestopping

- .1 Friction fit cavity firestopping in accordance with manufacturer's installation requirements.
- .2 Locate and install in continuous rows at maximum horizontal spacing of 20 m (65'7") on centre.

3.6 Cavity Drainage Material

- .1 Install cavity drainage units over weep hole vents, flashings, in exterior wythes of masonry cavity and veneer wall construction.
- .2 Install free-draining mesh units in continuous manner for full cavity length and depth.

3.7 Deflection Space Filler

- .1 Non-fire rated walls: Fill deflection space with deflection space filler. Where deflection space is exposed, tamp filler into deflection space 25 mm (1").
- .2 Fire-rated walls: Refer to requirements of Section 07 84 00.

3.8 Slip Sheet at Metal Lintels

- .1 Install slip sheet at loose lintel locations between bearing area of lintel and bed. Trim away exposed slip sheet.

END OF SECTION

Brick Masonry Units

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Clay brick.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00 and Section 04 05 00.

PART 2 - PRODUCTS

2.1 Materials

- .1 Manufacture: Manufacture total required brick in one continuous batch, for maximum colour and texture uniformity.
- .2 Clay brick:
 - .1 Exterior kiln fired clay brick veneer: in accordance with CAN/CSA A82-14.
 - .2 Size and colour: to match existing.

PART 3- EXECUTION

3.1 Laying

- .1 Lay masonry in accordance with good practice, CAN/CSA A371-14 and as accepted in mock-up sample wall and as specified in Section 04 05 00.
- .2 Review locations of coursing alignment and layout with *Consultant*, and seek approval, prior to commencement of the work of this section.

END OF SECTION

Concrete Masonry Units

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Concrete masonry units:
 - .1 Normal weight units.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00 and Section 04 05 00.

PART 2- PRODUCTS

2.1 Materials

- .1 Concrete masonry units:
 - .1 In accordance with CAN/CSA A165 SERIES-14.
 - .2 Include shapes, such as end, bond, sash groove, ledge and lintel units, required to complete the *Work*, with uniform appearance.
 - .1 *Provide* open end blocks where vertical reinforcing occurs in walls.
 - .2 *Provide* knock-out blocks where horizontal reinforcing bars occur in walls.
 - .3 Solid concrete masonry units may be used where grouted block is indicated, whenever reinforcing is not indicated, in lieu of grouted solid installation method.
 - .4 Size: metric.
- .3 Normal weight units:
 - .1 Hollow units: H/15/A/M, H/20/A/M, and H/30/A/M.
 - .2 Semi-solid units: SS/15/A/M, SS/20/A/M, and SS/30/A/M.
 - .3 Full solid units: SF/15/A/M, SF/20/A/M, and SF/30/A/M.
 - .4 Colour: grey.
 - .5 Profiles: as indicated.
- .4 Light weight units:
 - .1 Hollow units: H/15/C/M.
 - .2 Semi-solid units: SS/15/C/M.
 - .3 Full solid units: SF/15/C/M.
 - .4 Colour: grey.
 - .5 Profiles: as indicated.

Concrete Masonry Units

2.2 Source Quality Control

- .1 Perform tests on masonry units to determine compressive strength as required by jurisdictional authorities in accordance with CAN/CSA A165 SERIES-14.

PART 3 - EXECUTION

3.1 Preparation

- .1 Before commencing masonry work, verify that conditions at the *Place of the Work* will allow construction of masonry within required limitations for wall heights, wall thicknesses, openings, bond, anchorage, lateral support, and compressive strengths of masonry units and mortars.

3.2 Masonry Procedures

- .1 Lay masonry in accordance with good practice and CAN/CSA A371-14, as accepted in mock-up sample wall and in accordance with Section 04 05 00.

END OF SECTION

Structural Steel

- .1 General Conditions and Division 1, General Requirements, shall govern given Work of this Section.
- .2 Quantities and dimensions enclosed in brackets apply to Project for which Drawings are in imperial units.

1.1 Description

- .1 Work Supplied by this Section, but Installed by Others:
 - .1 Anchor rods and cast-in anchorages Section 03 10 00
 - .2 Loose bearings, bases and anchorages Section 03 30 00
 - .3 Loose bearings, built in anchors and loose lintels Section 04 20 00
- .2 Related Work Specified in Other Sections:
 - .1 Submittals and Shop Drawings Section 01 30 00
 - .2 Quality Control Section 01 40 00
 - .3 Grouting Baseplates and Bearing Plates on Cast-in-Place Concrete Section 03 30 00
 - .4 Steel Joists Section 05 21 00
 - .5 Steel Roof Deck Section 05 31 00
 - .6 Miscellaneous Metals Section 05 50 00
 - .7 Manufactured Roofing and Siding Section 07 61 113 & 07 46 19
 - .8 Intumescent Coatings Section 09 84 50
 - .9 Painting Section 09 90 00
- .3 Co-operation with Work of Other Sections:
 - .1 Check project Drawings and Specifications for requirements of other Sections, which will affect installation of Work of this Section.
- .4 Co-operation with Consultant:
 - .1 Before commencing Work, review with Consultant, Work performed under this Section.
- .5 Professional Liability Insurance:
 - .1 Submit proof of connection design Engineer's professional liability insurance coverage specified in this Section.

Structural Steel

.6 Calculations:

- .1 Submit design calculations if requested by Consultant.

1.2 Quality Assurance

.1 Reference Standards and Publications:

- .1 The following Reference Standards shall govern Work of this Section, except where they are in conflict with requirements imposed by this specification, in which case the latter shall govern. Standards referenced by following Standards apply, but are not necessarily repeated in the following list.
- .2 All standards to be latest issue at time of tender.
- .3 Provide one copy on site of the first two standards listed below:
- .1 2012 OBC, "Ontario Building Code".
 - .2 CAN/CSA-S16-19, "Limit States Design of Steel Structures".
 - .3 CSA S136-16 (R2021), "North American Specification for the Design of Cold-Formed Steel Structural Members".
 - .4 CSA-G40.20-13/G40.21-13 (R2018), "General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels".
 - .5 CAN/CSA-G164-18, "Hot Dip Galvanizing of Irregularly Shaped Articles".
 - .6 CSA-W47.1-19, "Certification of Companies for Fusion Welding of Steel Structures".
 - .7 CSA-W59-18, "Welded Steel Construction".
 - .8 CSA-W178.1-18, "Certification of Welding Inspection Organizations".
 - .9 CSA-W178.2-18, "Certification of Welding Inspectors".
 - .10 CSA-W186-21, "Welding of Reinforcing Bars in Reinforced Concrete Construction".
 - .11 ASTM A307-21, "Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength".
 - .12 ASTM F3125/F3125M-22, "Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength".
 - .13 ASTM A449-14(2020), "Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength General Use".

Structural Steel

- .14 ASTM A653/A653M-20, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized), or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".
 - .15 ASTM A1011/A1011M-18a, "Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength".
 - .16 ANSI/AISC 303-22 American Institute of Steel Construction (AISC) Code of Standard Practice for Steel Buildings and Bridges, Section 10, Architectural Exposed Structural Steel
- .2 Qualifications:
- .1 Undertake welding by fabricators and erections certified by the Canadian Welding Bureau under CSA-W47.1, Division 1 or 2.1 only.
 - .2 Fabricate structural steel only by a Fabrication Member of the Canadian Institute of Steel Construction.
 - .3 Fabricator shall incorporate own Quality Verification Program conforming to CSA Standard Z299.3.
 - .4 Connections Designed by Consultant:

Submission of shop and erection Drawings for connections, which have been detailed on Drawings by Consultant, represents acceptance by Contractor that connection can be executed successfully.
 - .5 Other Connections:
 - .1 Design of other connections which cannot be selected from standard designs tabulated in CISC Handbook of Steel Construction: by a Professional Engineer, licensed in the Province of Ontario, experienced in structural steel connection design.
 - .2 Consultant will review connection arrangement to verify general conformance with overall design concept of structure.
 - .3 Connection design Engineer to be insured against professional liability accordance with section 74 subsection [1] of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection [2] is not acceptable. Provide a minimum of \$2,000,000 coverage.
- .3 Design:
- .1 Connections:
 - .1 Connection Design: to CAN/CSA-S16.1 to resist all loads and forces shown on the Drawings and as noted below.

Structural Steel

- .2 Provide bolted or welded connections, unless shown otherwise on Drawings.
 - .3 Use high strength bolts, except that A307 bolts may be used for connections of roof purlins, bridging, girts and trimmer beams not connecting to columns, unless otherwise noted on Drawings.
 - .4 Design bolted bearing connections with threads included in the shear plane unless otherwise stated on erection Drawings.
 - .5 Use slip resistant connections for bolted joints designed to resist reversible forces, impact loads, seismic or wind loads, crane loads, tension loads and oversized and slotted holes not designed for movement.
 - .6 Provide tension adjustment hardware at rod type bracing and at flat bar type bracing.
 - .7 Do not permit connections to encroach on clearance lines required for installation of Work other Sections.
 - .8 Working points are centerline intersections of beams, columns, bracing members and baseplates.
- .2 Beam Connections:
- .1 Design connections to resist reaction of beam, when beam is loaded to maximum flexural capacity under uniformly distributed load, unless reaction or connection detail is shown on Drawings. For composite beam construction, use flexural capacity of composite section based on 100 percent shear connection of beam to slab.
 - .2 Provide flexible beam connections for unrestrained members in accordance with CSA S16.1, unless shown otherwise on Drawings.
 - .3 Select connections, wherever possible, from standard designs tabulated in current edition of CISC Handbook of Steel Construction, except that length of beam web angles shall not be less than half the depth of beam, and single angles shall not be used for beams deeper than 600mm.
 - .4 Provide direct connections to flanges of interior and exterior perimeter beams to restrain twisting but maintain flexibility in primary plane of bending.
- .3 Tolerances:
- .1 In accordance with CSA-S16.1. Erect shelf angles and members to which frames of windows, doors and louvers are connected directly and which are attached to steel frame, within a tolerance of 3 mm plus or minus, and with abutting ends of members at same level.

Structural Steel

- .4 Random Splicing:
 - .1 Obtain in writing from Consultant, prior to commencement of shop drawings, special requirements that will be imposed as a necessary condition of acceptance of members with randomly located butt-welded splices.
- .5 Source Quality Control:
 - .1 Inspection and testing of materials and shop fabrication of Work of this Section, and field quality control specified elsewhere in this Section, may be performed by an Inspection and Testing Company appointed by Consultant.
 - .2 Provide access for inspection to all places where Work is being undertaken or stockpiled.
 - .3 Review provided by Inspection and Testing Company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the Specification.
 - .4 Inspection and Testing Company shall be certified by Canadian Welding Bureau to CSA W178.1, Category 1, Buildings.
 - .5 Welding inspectors and supervisors shall be certified by Canadian Welding Bureau to CSA W 178.2, to minimum level 2 certification.
 - .6 Payment for specified Work performed by Inspection and Testing Company will be made from cash allowance specified in Section 01 20 00.
 - .7 Include in the contract sum, cost of inspection and testing of splices introduced by fabricator in steel sections at random locations.
 - .8 Inspection and Testing Company when appointed shall carry out shop and field inspection to verify:
 - .1 Structural materials and paint conform to Specifications. Mill test reports, properly correlated to the materials, will be accepted in lieu of physical tests of structural materials.
 - .2 Fabrication and welding conforms to Specifications and dimensioned shop drawings.
 - .3 Shop painting, and cleaning and preparation for same, conform to specified requirements.
 - .4 Surfaces inaccessible for cleaning and painting after assembly are treated before assembly.

Structural Steel

- .5 For surfaces painted with zinc-rich paint or zinc primer, specified surface preparation is followed, and specified paint thickness is applied.
- .6 Non-destructive Testing of Bolted Connections:
 - .1 Carry out non-destructive testing of bolted connections chosen at random as follows:
 - 10% ? 20% ? 25% of snug-tight bolted connections, minimum 2 bolts per inspected connection.
 - 10%? 20%? 25% of pretensioned bolted connections, minimum 2 bolts per inspected connection.
 - .7 Non-destructive Testing of Welded Connections:
 - .1 Carry out non-destructive testing of welded connections chosen at random as follows:
 - 10%? 20%? 25%? of moment connections involving use of fillet welds, by magnetic particle inspection.
 - All moment connections and all connections in direct tension involving use of Full Penetration Groove welds, by ultrasonic testing.
 - Where moments are transferred by either fillet welds or groove welds into end plates in "T" joint configurations, examine base metal for lamellar tearing or cracking, by ultrasonic testing, for all connections.
 - Welded studs. Bend tests 1 in 100, studs, visual 100% of studs.
 - .8 Additional costs for extra testing and inspection due to deficiencies to be paid by Contractor.

1.3 Submittals

- .1 Qualifications:
 - .1 Submit in writing evidence of qualification for welding under CWB.
 - .2 Submit evidence of ability to weld reinforcing steel in accordance with CSA-W186.
- .2 Professional Liability Insurance:
 - .1 Submit proof of connection design Engineer's professional liability insurance specified in this Section.

Structural Steel

- .3 Calculations:
 - .1 Submit design calculations if requested by Consultant.
- .4 Shop Drawings:
 - .1 Professional Engineer responsible for connection design shall either sign and seal each shop drawing submitted, or shall submit a signed and sealed letter at commencement of shop drawing preparation stating he will assume responsibility for compliance of connections with this Specification.
 - .2 Submit erection diagrams and shop details, fully detailed and dimensioned, with complete information necessary so that steel may be fabricated and erected without reference to Drawings. Indicate openings on the erection drawings and coordinate with the trades concerned. Copies of portions of the structural drawings will not be accepted as shop drawings.
 - .3 Where new Work connects to existing construction, determine existing conditions and all dimensions on site, including verification of all dimensions on Drawings. Report any necessary adjustments to Consultant.
 - .4 Submit for review erection drawings, typical details of connections and any special connections, before preparation of shop drawings.
 - .5 Submit typical details of connections and any special connections for review before preparation of shop drawings.
 - .6 Include whether snug-tight or pre-tensioned high-strength bolts are to be used, and whether threads are to be included or excluded from shear plane.
 - .7 Show splice locations and details.
 - .8 Indicate colour of primer and number of coats.
 - .9 Prior to submission to Consultant, Contractor shall review all shop drawings. By this review, Contractor represents to have determined and verified all field measurements, site conditions, materials, catalogue numbers and similar data, and to have checked and coordinated each shop drawing with the requirements of Work and of Contract Documents. Stamp, date and signature of the Contractor's representative shall indicate contractor's review of each shop drawing.
 - .10 At time of submission, Contractor shall notify Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.
 - .11 Consultant will review and return shop drawings in accordance with an agreed schedule. Consultant's review is intended as an assistance to the Contractor and will be for conformity to design concept and for general arrangement, and shall not relieve Contractor of responsibility for errors and omissions in shop drawings or of responsibility for meeting all requirements of Contract Documents.

Structural Steel

- .12 Contractor shall make changes in shop drawings, which Consultant may require, consistent with Contract Documents, and resubmit unless otherwise directed by Consultant. When resubmitting, Contractor shall notify Consultant in writing of revisions other than those requested by Consultant.
- .13 Fabrication prior to receipt of shop drawing review comments is at the risk of this Section.
- .14 Shop drawings refers to detailed shop drawings for all individual members and associated erection and fieldwork Drawings.
- .15 Submit shop drawings as follows:
 - 1 copy of erection diagrams, shop and fieldwork drawings for review before any Work commences
 - 1 copy additional copies of shop, fieldwork and erection drawings for distribution as directed by Consultant.
 - 1 copy of reviewed shop, fieldwork and erection diagrams to Inspection and Testing Company.
- .16 Submit shop drawings in accordance with Section 01 30 00.
- .5 Erection Procedures: Submit to Consultant or regulatory authorities for review, diagrams showing methods of erection proposed, if so directed by Consultant or regulatory authorities.
- .6 Paint Performance: If requested by Consultant, submit paint manufacture's certification that paint conforms to CISC/CPMA Standard specified, or other requirements specified and its compatibility with topcoats specified elsewhere.
- .7 Quality Verification Manual: Submit quality verification manual in accordance with this Section, before award of contract.
- .8 Inspection Procedure and Reports:

Inspection and Testing Company shall:

 - .1 Submit Inspection Procedure.
 - .1 Submit to Consultant procedure, which shall be followed to verify compliance with the Drawings and Specifications. Include details of any random sampling procedures, general instructions given to inspectors and special instructions pertaining to aspects peculiar to this Project. Submission of this procedure shall not relieve Inspection and Testing Company of responsibility to confirm that completed structural steelwork complies with above requirements.
 - .2 Submit reports at least weekly when shop and site Work of this Section is in progress.

Structural Steel

- .3 Distribute inspection reports as follows:
 - 2 copies to Consultant;
 - 1 copy to Consulting Structural Engineer;
 - 1 copy to Contractor;
 - 1 copy to Steel Fabricator.
- .4 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.
- .5 Include deficiency list of outstanding items from previous reports, indicate date of first observation and date of corrective action, and comment on status.

1.4 Storage and Handling

- .1 Deliver products that are supplied only under Work of this Section to trades responsible for their installation, to location they direct, and to meet construction schedule.
- .2 Exercise care in storing and handling all materials of this Section. Handle and store structural steel so that no damage or corrosion is caused to stored or erected Work, or to other property.
- .3 Protect architecturally exposed steel during fabrication, handling, storage and erection to prevent marring of surfaces exposed to view, by marking, bending, denting, or coarse grinding.

PART 2 – PRODUCTS

Unit Prices

- .1 Unit prices requested as part of Tender shall include Work erected in place, and preparation and submittal of shop drawings.
- .2 Unit prices shall serve as a basis for computing value of additional or deleted Work and alterations, including cutting and reinforcing of holes, performed as Changes to Work.
- .3 Base estimate of steel tonnage on CISC standard method of computing weights. Use net dimensions of shapes and plates, without allowance for weight variations due to mill tolerances.
- .4 Unit prices to be applied to net mass difference per category.

Materials

- .1 Provide new materials in accordance with Reference Standards, of strength and quality noted on Structural Drawings.
- .2 Cold Formed Channel's:
 - Fabricate from hot rolled sheet to ASTM A570/A570M, Grade 50.
 - Fabricate from zinc-coated sheet to ASTM A653/A653M, Structural Quality Grade 50 Class 1.

Structural Steel

- .3 Anchor rods: to ASTM A307, and to typical details on Drawings.
- .4 Welded Studs: to ASTM A108.
- .5 Galvanizing:
 - .1 Zinc coating CAN/CSA G164 with a minimum coating of ??600 ??700 ??900 g/m².
- .6 Paint:
 - .1 Shop Coat Paint, for steel that will not receive finish coat: to CISC/CPMA Standard 1-73a, "A Quick-Drying One-Coat Paint for Use on Structural Steel".
 - .2 Prime Paint: to meet requirements of CISC/CPMA 2-75, "A Quick-Drying Primer for Use on Structural Steel".
 - .3 Inorganic Zinc Primer:
 - Carbo Zinc 11, by Corrosion Service Co. Ltd.
 - Dimetcote 9, by Ameron Canada Inc., Oakville, and Ontario
 - Catha-Coat 304L, by ICI-Devoe (Glidden) Ltd.
 - .4 Zinc-Filled Epoxy Polyamide Primer:
 - Carboline 658, by Corrosion Service Co. Ltd.
 - Amercoat 68A, by Ameron Canada Inc., Oakville, Ontario
 - Catha-Coat 313, by ICI-Devoe (Glidden) Ltd.
 - .5 Zinc-Rich Paint – Organic, Ready Mixed:
 - Galvafroid, by W. R. Meadows Ltd.
 - Catha-Coat 13034, by ICI-Devoe (Glidden) Ltd.
- .7 Sliding Bearings:
 - .1 Steel upper sole plate, with stainless steel lower face with #10 mirror finish. Stainless steel to bear on pure virgin Teflon surfaced lower pad of reinforced elastomer of smaller dimensions than sole plate, as designed and supplied by:
 - Structural Tech Corporation, Sarnia, Ontario
 - Goodco Ltd., Markham, Ontario
- .8 Floor Grating:
 - .1 Galvanized, welded steel, of adequate strength and stiffness to support loadings given on Drawings, with maximum deflection of 1/180 of span, and with banded ends.
 - Type W/F, by Borden Products Canada Ltd.
 - Type 19-2, by Fisher & Ludlow.

Structural Steel

Fabrication

- .1 Fabricate Work of this Section in accordance with CSA-S16.1, and as specified below.
- .2 Notify Consultant and Inspection and Testing Company a minimum of 24 hours prior to fabricating any steel to allow for inspection.
- .3 Accurately cut and mill column ends and bearing plates to assure full contact of bearing surfaces prior to welding.
- .4 Seal all hollow structural sections with suitable cap plates or by welding all around to adjoining members.
- .5 Provide 10 mm plate stiffeners each side of beam where continuous over supports.
- .6 Provide 10 mm plate stiffener one side of beam at all bearing connections.
- .7 Camber horizontal members as noted on Drawings.
- .8 Weld reinforcing steel where indicated. Weld in accordance with applicable requirements of CSA-W186. Do not weld reinforcing at any location without written approval of the Consultant.
- .9 Holes:
 - .1 Punch holes 11 mm to 28 mm diameter as required for attaching the Work of other Sections to structural steel members. Locate holes so that no appreciable reduction of strength of members is caused,
 - .2 Provide holes for pipes and ducts, and reinforce openings as indicated on Drawings. Cutting of holes or openings in structural members in shop or field will not be permitted except with written approval of Consultant.
 - .3 Provide effective drainage holes to prevent accumulation of water in tubular members.
- .10 Base Plates:
 - .1 Provide single base plates. Do not use separate levelling plates for columns.
- .11 Welded Studs:
 - .1 Install accordance with CSA W59, Appendix H.
- .12 Architecturally Exposed Steelwork:
 - .1 Fabricate and maintain straightness of structural steelwork which will be left exposed to view as finished surface, in accordance with American Institute of Steel Construction Code of Standard Practice for Steel Buildings and Bridges, Section 10, Architecturally Exposed Structural Steel, and as follows:

Structural Steel

- .1 Continuously seal weld connections exposed on exterior or interior of building.
 - .2 Finish exposed welds smooth and flush with adjacent surfaces.
 - .3 Remove mill marks, identification marks and surface imperfections, smooth and flush with adjacent surface.
 - .4 Do not mar surface with grind marks that are clearly visible after painting.
 - .5 Do not use stitch welds where welding is exposed to view.
- .13 Masonry Anchors:
- .1 Provide masonry strap anchors welded to structural steel.
 - .2 Provide for attachment of adjustable flexible anchors that are supplied by mason.
 - .3 Provide wall anchors for beams bearing on masonry or concrete.
- .14 Lintels:
- .1 Provide 150 mm minimum bearing for angle lintels, and bolt or weld together upstanding legs of angle lintels at 600 mm centre.
- .15 Cleaning Steel:
- .1 Clean steel, whether it is to be painted or not, to the degree required by CISC/CPMA 1-73a, except as specified below.
 - .2 Clean steel, which is specified to be painted to CISC/CPMA 2-75 in accordance with that Standard.
 - .3 Clean steel which is specified to receive an organic zinc-filled epoxy primer, or zinc-rich paint, or inorganic zinc primer, in accordance with SSPC-SP 6, Commercial Blast Cleaning.
- .16 Painting:
- .1 Paint interior steel surfaces that are not specified to receive top coat or zinc primer or zinc-rich paint, with one coat of paint to CISC/CPMA 1-73a.
 - .2 Prime interior steel surfaces that are specified in Section 09 90 00 to be finish painted, and are not specified to receive zinc primer, with one coat of prime paint to CISC/CPMA 2-75.
 - .3 Prime steel surfaces specified on Drawings to receive inorganic zinc primer, or zinc-filled epoxy polyamide primer, with one coat to an average dry film thickness of 65 microns and a minimum dry film thickness of 50 microns

Structural Steel

- .4 Paint steel surfaces exterior to the building vapour barrier and not specified to be galvanized or painted with zinc primer, with two coats of zinc-rich paint specified in paragraph 0.6.5, applied to an average dry film thickness of 38 microns per coat and a minimum dry film thickness of 23 microns per coat.
- .5 Do not paint:
 - Surfaces and edges within 50 mm of field welds.
 - Surfaces encased in, or in contact with concrete, including the top flange of beams supporting cast-in-place slabs.
 - Surfaces to be spray fireproofed.
- .6 Apply paint in accordance with manufacturer's published directions.
- .7 Paint steel in shop under cover and keep under cover until paint has dried.
- .8 Primers to be different and distinctive colour for each coat used.
- .17 Galvanizing:
 - .1 Galvanize lintels, brick support angles, architectural block support angles, and other members indicated as galvanized on Drawings, after shop welding is complete.

PART 3 – EXECUTION

3.1 Examination

- .1 Verify, before delivery of structural steel, that Work of other Sections on which Work of this Section is dependent is correctly installed and located.

3.2 Preparation

- .1 Supply Anchor rods, base and bearing plates and other members to be built in under Work of other Sections as Work progresses. Co-operate with installers of this Work and provide instructions for its setting.
- .2 Where new Work connects to existing construction, determine site conditions and dimensions accurately in field. Report any necessary adjustments to Consultant.

3.3 Erection

- .1 Notify Consultant and Inspection and Testing Company a minimum of 24 hours prior to erecting any structural steel to allow for inspection.
- .2 Do not field cut or alter structural members without the written approval of the Consultant. Report to the Consultant every failure of material to fit together properly and submit proposed corrective measures. Corrective measures must be approved by the Consultant.
- .3 Comply with requirements of Reference Standards and requirements of regulatory authorities, in erection of Work of this Section.

Structural Steel

- .4 Make adequate provision for horizontal and vertical erection loads and for sufficient temporary bracing, to maintain structure safe, to keep structural frame plumb and in true alignment until completion of erection, and installation of permanent bracing, masonry, concrete work, and floor and roof decks which provide stability to completed building.
- .5 Provide temporary steel members as may be required for erection purposes and remove when no longer required.
- .6 Beam Bearing Plates and Column Base Plates:
 - .1 Set beam bearing plates and column base plates, at proper elevation, true and level, with steel shims, ready for grouting as specified under Work of other Sections.
 - .2 Install sliding bearings specified in paragraph 0.7 in accordance with manufacturer's recommendations.
- .7 Floor Grating:

Weld or security fasten at least two bearing bars of each grating panel specified in paragraph 0.8, to every supporting steel beam unless otherwise noted.
- .8 Erect architecturally exposed steel in accordance with specified requirements of AISC Code of Standard Practice, Section 10, Architecturally Exposed Structural Steel.

3.4 Quality Control

- .1 Inspection and Testing Company, when appointed as specified in Source Quality Control elsewhere in this Section, shall perform:
 - .1 Inspection of erection and fit-up, including placing, plumbing, levelling and temporary bracing and conformance with specified tolerances.
 - .2 Inspection of bolted connections, including verification that A307, A325/A325M snug tight only bolts, and A325/A325M pretensioned bolts have been used appropriately, and that threads are excluded from shear plane where required.
 - .3 Inspection of welded joints, including slag removal.
 - .4 General inspection of field cutting and alterations; report immediately to Consultant, alterations or cutting not shown on reviewed shop drawings.
 - .5 General inspection of shop coating touch-up.
 - .6 Inspection of zinc primer and zinc-rich paint, including surface preparation and coating thickness.

3.5 Coating Touch-Up

- .1 Clean welds to remove all residues from electrodes.

Structural Steel

- .2 After erection is complete, give one coat of touch-up paint to field bolts, field connections, burnt areas, and abrasions or damage to prime coats.
 - .1 Use a compatible primer to touch-up 1-73a or 2-75 shop-applied primer.
 - .2 Use compatible organic zinc-filled epoxy primer to touch-up inorganic or organic zinc primer.
 - .3 Use a compatible zinc-rich paint to touch-up shop or field applied zinc-rich paint.
 - .4 Give areas of bare metal on galvanized members two coats of zinc-rich paint.

3.6 Defective Work

- .1 Variations in excess of specified tolerances, and failure of materials or workmanship to meet requirements of this specification, will be considered defective Work performed by this Section.
- .2 Replace defective Work, as directed by Consultant.
- .3 Contractor shall pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work is deficient, or fails to meet the shop or fieldwork drawing details. Costs for additional inspection testing, review and redesign to be deducted from Contract Value.
- .4 The Consultant may order further testing, inspection and analysis at any time. In this instance, the Owner will pay for those tests, inspections or analysis that meet the specified requirements, and the Contractor will pay for those that do not.

END OF SECTION

Steel Roof Deck

PART 1 - GENERAL

1.1 General Requirements

- .1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.
- .2 Quantities and dimensions enclosed in brackets apply to Project for which Drawings are in imperial units.

1.2 Description

- .1 Work Supplied by this Section but Installed by Others:
 - .1 Install anchorage assemblies Section 03 10 00
 - .2 Install anchorage assemblies Section 04 20 00
- .2 Related Work Specified in Other Sections:
 - .1 Submittals and Shop Drawings Section 01 30 00
 - .2 Quality Control Section 01 40 00
 - .3 Concrete Formwork Section 31 10 00
 - .4 Cast-in-Place Concrete Section 03 30 00
 - .5 Unit Masonry Section 04 20 00
 - .6 Structural Steel Section 05 12 00
 - .7 Steel Joists Section 05 21 00
 - .8 Painting Section 09 90 00
- .3 Co-operation with Work of Other Sections:
 - .1 Check project Drawings and Specifications for requirements of other Sections, which will affect installation of Work of this Section.
- .4 Co-operation with Consultant:
 - .1 Before commencing Work, review with Consultant, Work performed under this Section.
 - .2 Schedule Work to allow sufficient time and access for Consultant to carry out periodic field review.
- .5 Cooperation with Inspection and Testing Company:
 - .1 Provide free access to Work.

Steel Roof Deck

1.3 Quality Assurance

.1 Reference Standards & Publications:

- .1 All standards to be latest issue at time of tender.
- .2 Provide one copy on site of the first four standards listed below.
- .3 The following reference standards shall govern Work of this Section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following Standards apply but are not necessarily repeated in following list:
 - .1 2012 OBC, "Ontario Building Code".
 - .2 "The Supplement to the National Building Code of Canada", 2020 Edition.
 - .3 CSSBI 10M-18, "Standard for Steel Roof Deck", Published by Canadian Sheet Steel Building Institute.
 - .4 CSA S136-16 (R2021), "North American Specification for the Design of Cold-Formed Steel Structural Members".
 - .5 CSA-W178.1-18, "Certification of Welding Inspection Organizations".
 - .6 CSA-W47.1-19, "Certification of Companies for Fusion Welding of Steel Structures".
 - .7 CSA-W178.2-18, "Certification of Welding Inspectors".
 - .8 ASTM Standard A653/A653M-22, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process".
 - .9 FM Global Loss Prevention Data Sheets 1-28 (2022), 1-28R/1-29R (1998), 1-29 (2022) and 1-54 (2021).
 - .10 FM Global Approval Guide.

.2 Regulations:

- .1 Abide by current bylaws and regulations of the province and/or municipality in which the Work is located, and abide by the current laws and regulations with regard to public safety.

Steel Roof Deck

.3 Qualifications:

- .1 Undertake welding only by organizations certified under Division 2.1 or higher, by Canadian Welding Bureau under CSA Standard W47.1. Part of the Work may be sublet to a Division 3 firm, provided that the Division 1 or 2.1 firm retains the responsibility for the Work. Welders to be certified for deck welding by Canadian Welding Bureau.
- .2 Design of steel roof deck shall be by a Professional Engineer licensed in the Province of Ontario with a minimum of 5 years Canadian experience in steel roof deck design.
- .3 Steel deck design engineer shall be insured against professional liability in accordance with Section 74 Subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with Subsection (2) is not acceptable. Provide a minimum of \$2,000,000 coverage.
- .4 Consultant will review general arrangement to verify general conformance with overall design concept of structure.

.4 Design:

- .1 Design steel roof deck as part of system specified in Section 07630. Design for loads imposed by roofing system and its fasteners.
- .2 Design roof deck and fasteners in conformance with CSSBI 10M Article 8.6.
- .3 Design roof deck and fasteners to support dead plus live loads shown on Drawings and concentrated loads stipulated on the drawings and in NBC Table 4.1.6.B, and for not less than the load nor more than the deflection stipulated in CSSBI 10M Clause 8.6.5.
- .4 Limit roof deck deflections to the lesser of following:
 - Live load L/360 or 20 mm
 - Total load L/240 or 20 mm
- .5 Design roof deck and fasteners to resist the following minimum gross unfactored uplifts, where widths of "s", "c" and "r" areas are defined in the Supplement to the National Building Code of Canada, Commentary B, Figure B-9.

Canopies	2.00 kPa (42 psf)
Edge strips "s"	1.25 kPa (26 psf)
Corner areas "c"	2.38 kPa (50 psf)
Other roof areas "r"	1.00 kPa (20 psf)

Dead load of roof deck construction may be deducted from these uplifts, after applying relevant load factors for wind load, and dead load resisting uplift.

Steel Roof Deck

- .6 Design roof deck and fasteners to resist the following minimum gross unfactored uplifts, where widths of "s", "c" and "r" areas are defined in the Supplement to the National Building Code of Canada, Commentary B, Figure B-9.
- | | |
|----------------------------|----------|
| Canopies | 2.00 kPa |
| Edge strips "s" | 1.52 kPa |
| Corner areas "c" | 2.64 kPa |
| Other roof areas "r" | 1.25 kPa |
- Dead load of roof deck construction may be deducted from these uplifts, after applying relevant load factors for wind load, and dead load resisting uplift.
- .7 For FM Global approval of 76 mm (3") deck, be aware that FM Global limits the unfactored weld capacity for 0.76 mm (22ga./0.030") deck to 1.825 kN, 2.336 kN, and 2.825 kN (410 pounds, 525 pounds, & 635 pounds) for 12.5 mm, 16 mm, and 19 mm diameter puddle welds respectively. These capacities may be multiplied by 1.21 and 1.57 for 0.91 mm (20ga./0.36") and 1.22 mm (18 ga./0.048") decks, respectively.
- .8 Design roof deck and fastening, including side lap fastening, fastenings to continuous diaphragm boundary elements and vertical lateral load resisting elements, for diaphragm action and to resist diaphragm shears shown on Drawings.
- .9 Steel decking is to be rigid enough and connected sufficiently to provide lateral support for the top chord or flange of the supporting elements.
- .10 In addition to the forgoing requirements, conform to FM Global Loss Prevention Data Sheets 1-28, 1-28R/1-29R, 1-29, & 1-54, including but not restricted to wind uplift loading, minimum concentrated load recommendations (including deflection limitations under this loading), fastening, and deck geometry and thickness.
- .11 Verification of design capacities by calculation to be made available on request.
- .5 Suspended Loads:
- Do not suspend ceilings, lights, ducts, piping, or any other item from steel roof deck.
- .6 Requirements of Regulatory Agencies:
- .1 Fabricate and install roof deck, which forms part of a required fire rated system exactly as specified in Underwriter's Laboratories test design specification that validates required rating.
- .7 Tolerances:
- .1 Comply with requirements of CSSBI 10M, Clause 5.2.
- .2 Lay and position roof deck within a tolerance of plus or minus 12 mm (1/2") with respect to edges of deck parallel to flutes and centrelines of columns and building exterior lines.

Steel Roof Deck

- .8 Source Quality Control:
 - .1 Inspection and testing materials and fabrication of Work of this Section, and field quality control specified elsewhere in this Section, may be performed by an Inspection and Testing Company appointed by Consultant.
 - .2 Review provided by Inspection and Testing Company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of this specification.
 - .3 Inspection and Testing Company shall be certified by Canadian Welding Bureau, to CSA W178.1, Category 1, Buildings.
 - .4 Welding inspectors and supervisors shall be certified by Canadian Welding bureau to CSA W178.2.
 - .5 Payment for specified Work performed by Inspection and Testing Company will be made by Owner.
 - .6 Provide access for inspection to all places where Work is manufactured, stockpiled or installed.

1.4 Submittals

- .1 Qualifications:
 - .1 Submit in writing evidence of qualification for welding under CWB.
- .2 Professional Liability Insurance:
 - .1 Submit proof of design Engineer's professional liability insurance coverage specified in paragraph 1.3.1.2
- .3 Shop Drawings:
 - .1 Submit shop and erection drawings in accordance with Section 01 30 00 and as specified below. Copies of portions or all of the structural drawings will not be accepted as shop drawings.
 - .2 Each shop drawing submitted shall bear the seal and signature of the Professional Engineer responsible for roof deck design.
 - .3 Indicate: design loading; including snow, rain, uplift and diaphragm loadings; concentrated loads required by NBC; thickness and steel grade of material; zinc coating designations; layout of units; framing and supports; required minimum bearing; anchorages; size, spacing and type of fastening to meet uplift and diaphragm action; openings and their reinforcement; accessories; and details of construction, including warping of deck to provide slopes for drainage.

Steel Roof Deck

- .4 Prior to submission to Consultant, Contractor shall review all shop drawings. By this review, Contractor represents to have determined and verified all field data, and to have checked and coordinated each shop drawing with requirements of Work and of Contract Documents. Contractor's review of each shop drawing shall be indicated by stamp, date and signature of the Contractor's representative.
 - .5 At time of submission, Contractor shall notify Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.
 - .6 Consultant will review and return shop drawings in accordance with an agreed schedule. Consultant's review is intended as an assistance to the Contractor and will be for conformity to design concept and for general arrangement, and shall not relieve the Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of Contract Documents.
 - .7 Contractor shall make changes in shop drawings, which Consultant may require, consistent with Contract Documents and resubmit unless otherwise directed by Consultant. When resubmitting, Contractor shall notify Consultant in writing of revisions other than those requested by Consultant.
 - .8 Fabrication and construction that commences prior to shop drawing review by the Consultant is at the Contractor's risk.
 - .9 Show on the shop drawings the FM Global recommendations including fastening type, size, and spacing for side laps and to supports, and a statement that the deck and its installation are designed to meet FM Global recommendations.
 - .10 Submit shop drawings as follows:
 - 1 copy for review before any Work commences.
 - 1 additional copy of shop and erection drawings for distribution as directed by Consultant.
 - 1 copy of reviewed shop and erection diagrams to Inspection and Testing Company.
 - .11 Submit shop and erection drawings in accordance with Section 01 30 00.
- .4 Mechanical Fasteners:
- .1 Submit supporting evidence of mechanical fastener capacity to resist uplift, deck diaphragm action, and corrosion.
 - .2 Submit evidence of mechanical fastener's conformance to FM Global recommendations.
 - .3 Submit samples of mechanical fasteners.
- .5 Steel Deck:
- .1 Submit evidence that steel deck is FM Global approved.

Steel Roof Deck

- .6 Inspection Reports:
 - .1 Inspection and Testing Company shall:
 - .1 Base inspection and testing upon Contract Drawings, specifications and reviewed shop and erection drawings bearing Stantec review stamp.
 - .2 Report immediately to Consultant, by phone, any deviations from the Contract Drawings, giving recommendations for further testing deemed necessary. No modifications to be made or instructions given without prior approval of Consultant.
 - .3 Submit reports at least weekly when shop and site Work of this Section is in progress. At beginning of each report, state whether Contract Requirements have been met and list separately conditions not meeting requirements.
 - .4 Distribute inspection reports as follows:
 - 2 copies to Consultant.
 - 1 copy to Consulting Structural Engineer.
 - 2 copies to Contractor.
 - .5 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.
 - .6 Include an ongoing deficiency list of outstanding items from previous reports; indicate date of first observation, comment on status and date of corrective action, and comment on status.
 - .7 Issue final report at end of the applicable phases of work signifying that work is in overall conformity with Contract Documents and reviewed shop drawings.

1.5 Storage and Handling

- .1 Deliver anchorages supplied under Work of this Section to those responsible for their installation, to the location they direct, and to meet construction schedule.
- .2 Exercise care in storing and handling materials of this Section. Handle and store roof deck so that no damage or corrosion is caused to stored or erected Work, or to other property.
- .3 Comply with requirements of CSSBI 10M, Clause 8.10.
- .4 Co-ordinate Work of this Section with Work specified in other Sections for structural bearing members, and arrange to deliver and install steel roof deck in accordance with erection schedule of bearing members. Install steel roof deck at proper times to serve as safety planking during steel erection.

Steel Roof Deck

PART 2 - PRODUCTS

2.1 Unit Prices

- .1 Unit prices requested as a part of the Tender shall include Work erected in place, and preparation and submittal of necessary shop and erection drawings.
- .2 Unit prices to be applied to the net area difference.

2.2 Materials

- .1 Sheet Steel:
 - To ASTM A653M and CSA S136.
 - Grade "230" minimum.
 - Base steel nominal thickness 0.76 mm (0.030") or greater.
 - Minimum zinc coating designation ZF75.
 - Minimum zinc coating designation Z275.
- .2 Prefinished Sheet Steel:
 - To ASTM A653M and CSA S136.
 - Grade "230" minimum.
 - Basic steel normal thickness 0.76 mm (0.030") or greater.
 - Minimum zinc corrosion designation Z275.
 - 8000 Series.
 - 10000 Series.
 - Elite Series.
 - Metallic Series.
 - Barrier Series, Classification 200.
 - Barrier Series, Classification 300.
 - Prefinished one side only
 - Prefinished two sides
- .3 Verify that finish or treatment of zinc coated steel coil provided by steel mill is not detrimental to adhesion of paint system specified for steel roof deck in Division 9.
- .4 Zinc-Rich Paint: to CGSB Specification CAN/CGSB-1.181.
- .5 Fasteners:
 - .1 Approved, corrosion resistant, of adequate capacity to resist uplift and diaphragm shear forces when test strengths are evaluated in accordance with procedures adopted by the Steel Deck Institute, St. Louis, Missouri.
 - .2 In addition to foregoing, fasteners shall be FM GLOBAL-Approved.

Steel Roof Deck

- .6 Sound Absorbent Filler: Glass fibre, density of 17.6 kg/m³ (1.1 lb/ft³) shaped to fit profile of flutes.
- .7 Acoustical Closures: 25 mm (1") thick closed cell foam rubber, profiled to decking.
- .1 Comply with requirements of CSSBI 10M, Clause 5.

2.3 Fabrication

- .1 Fabricate roof deck in accordance with Drawings and specifications and reviewed shop drawings.
- .2 Comply with requirements of CSSBI 10M, Clause 5.
- .3 Fabricate deck with 150 mm (6") flute spacing, and with maximum 64 mm (2.4") width of rib opening (rib opening measured at top of rib, not bottom), in accordance with FM Global Data Sheet 1-28.
- .4 Acoustic Deck:
 - .1 Fabricate acoustic deck with rib webs perforated with 3mm (1/8") diameter holes staggered at 10mm (3/8") centres.
- .5 Reinforcement for Openings:
 - .1 Provide reinforcement for openings in accordance with CSSBI 10M, Clause 8.7.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify and approve alignment and levels of supporting members before laying roof deck. Do not proceed with erection until conditions are made satisfactory.

3.2 Erection

- .1 Notify Consultant and Inspection and Testing Company a minimum of 24 hours prior to erecting any steel roof deck to allow for inspection.
- .2 Comply with requirements of CSSBI 10M, Clauses 7 and 8.7 and as specified herein.
- .3 Use mechanical fasteners in areas to receive prefinished steel deck.
- .4 Cutting and Fitting:
 - .1 Cut and fit roof deck and accessories around projections through roof.
 - .2 Make cuts square with neatly trimmed edges.
- .5 Provide suitable deck support for all top edges of unsupported flutes where deck is trimmed parallel to flutes.

Steel Roof Deck

- .6 Closures:
 - .1 Install sheet metal closures to match steel deck material in flutes where indicated on Drawings and where required to close openings, as at junction of walls and partitions with deck.
 - .2 Install sheet metal covers plates at changes of deck direction, and at ridges and valleys.
 - .3 Secure closures and cover plates by either sheet metal screws or welding.
 - .4 Install acoustical closures in locations with acoustic deck above walls and partitions.
- .7 Slide Lap Fastening:
 - .1 Fasten side laps as required to meet design requirements of paragraph 1.3.3, but not less than the requirements of CSSBI 10M, clause 8.7.
 - .2 Provide additional fasteners as necessary to meet recommendations of FM Global Data Sheet 1-28.
- .8 Fastening to Supports:
 - .1 Fasten deck to supports as required to meet design requirements of paragraph 1.4.3, but not less than the requirement of CSSBI 10M, Clause 8.7.
 - .2 Fasten deck to perimeter members parallel to flutes with 20 mm (3/4") diameter fusion welds at 300 mm (12") maximum centres and as required to meet requirements of paragraph 1.4.3.
 - .3 Provide additional fasteners as necessary to meet recommendations of FM Global Data sheet 1-28.
- .9 Install prefinished steel deck after finish painting of supporting members. Co-ordinate with Section 09 90 00.

3.3 Field Quality Control

- .1 Inspection and Testing Company, when appointed as specified in Source Quality Control elsewhere in this Section, shall perform:
 - .1 Verification of grade of steel, material thickness, depth and dimensions of profile and zinc coating thickness.
 - .2 Verification of reinforcement at openings.
 - .3 Verification that bearing, erection and fastening comply with Contract Documents.
 - .4 General inspection of coating touch-up.

Steel Roof Deck

- .5 Pry tests of roof deck welds to supports.

3.4 Coating Touch-Up

- .1 After erection, wire brush, clean and paint welding areas, rust spots, and scratched or otherwise damaged areas of zinc coating on deck and shop-applied prime paint of structural members.
- .2 Apply two coats of zinc-rich paint to zinc coated areas specified above.
- .3 Apply one coat of primer paint to prime painted areas specified above. Verify that touch-up paint is same type as shop coat.
- .4 Apply one coat of primer paint and matching topcoat to minor paint-damaged prefinished deck areas. Verify that touch-up paint is same type and matching colour to shop paint.

3.5 Defective Work

- .1 Variations in excess of specified tolerances and failure of materials or workmanship to meet requirements of this specification will be considered defective Work performed by this Section.
- .2 Replace defective Work, as directed by Consultant.
- .3 Replace bent, warped, dented, punctured or weld-perforated deck where exposed to view.
- .4 Contractor shall pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work is deficient or fails to meet the shop or fieldwork drawing details. Costs for additional inspection, testing, review and redesign to be deducted from Contract Value.

END OF SECTION

Steel Floor Deck

PART 1 - GENERAL

1.1 General Requirements

- .1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.
- .2 Quantities and dimensions enclosed by brackets apply for Project for which Drawings are in imperial units.

1.2 Description

- .1 Work Supplied by This Section but Installed by Others:
 - .1 Install anchorage assemblies Section 03 10 00
 - .2 Install anchorage assemblies Section 04 20 00
- .2 Related Work Specified In Other Sections:
 - .1 Submittals and Shop Drawings Section 01 30 00
 - .2 Quality Control Section 01 40 00
 - .3 Concrete Formwork Section 03 10 00
 - .4 Concrete Reinforcement Section 03 20 00
 - .5 Cast-in-Place Concrete Section 03 30 00
 - .6 Unit Masonry Section 04 20 00
 - .7 Structural Steel Section 05 12 00
 - .8 Steel Joists Section 05 21 00
 - .9 Steel Roof Deck Section 05 31 00
 - .10 Painting Section 09 90 00
- .3 Co-operation with Work of Other Sections:
 - .1 Check project Drawings and Specifications for requirements of other Sections, which will affect installation of Work of this Section.
- .4 Co-operation with Consultant:
 - .1 Before commencing Work, review with Consultant, Work performed under this Section.
 - .2 Schedule Work to allow sufficient time and access for Consultant to carry out periodic field review.

Steel Floor Deck

.5 Cooperation with Inspection and Testing Company:

.1 Provide free access to Work.

1.3 Quality Assurance

.1 Reference Standards:

.1 All Standards to be latest issue at time of tender.

.2 Provide one copy on site of the first three standards listed below.

.3 The following Reference Standards shall Govern Work of this Section, except where they are in conflict with requirements imposed by this Specification, in which case the latter shall govern. Standards referenced by following Standards apply but are not necessary repeated in following list:

.1 2012 OBC, "Ontario Building Code".

.2 "The Supplement to the National Building Code of Canada", 2020 Edition.

.3 CSSBI 12M-18, "Standard for Composite Steel Deck", Published by the Canadian Sheet Steel Building Institute.

.4 ASTM Standard A653/A653M-22, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process".

.5 CAN/CGSB -1.181-99, "Ready-Mixed Organic Zinc-Rich Coating".

.6 CSA C22.2 No. 79:16 (R2021), "Cellular Metal and Cellular Concrete Floor Raceways and Fittings".

.7 CSA S16.1-19, "Design of Steel Structures".

.8 CSA S136-16 (R2021), "North American Specification for the Design of Cold Formed Steel Structural Members".

.9 CSA W47.1:19, "Certification of Companies for Fusion Welding of Steel".

.10 CSA W178.1-18, "Certification of Welding Inspector Organizations".

.11 CSA W178.2-18, "Certification of Welding Inspectors".

.2 Regulations:

.1 Abide by current bylaws and regulations of the province and/or municipality in which the Work is located, and abide by the current laws and regulations with regard to public safety.

Steel Floor Deck

- .3 Qualifications:
 - .1 Undertake welding only by organizations certified under Division 2.1 or higher, by Canadian Welding Bureau under CSA Standard W47.1. Part of the work may be sublet to a Division 3 firm, providing that the Division 1 or 2.1 firm retains the responsibility for the Work. Welders to be certified for deck welding by Canadian Welding Bureau.
 - .2 Design of steel floor deck, shall be by a Professional Engineer licensed in the Province of Ontario, with a minimum of five years of Canadian experience in steel floor deck design.
 - .3 Steel deck design engineer shall be insured against professional liability in accordance with Section 74 Subsection (1) of Regulation 941 of the Ontario Professional Engineers Act. The alternative of compliance with subsection (2) is not acceptable. Provide a minimum of \$2,000,000 coverage.
 - .4 Consultant will review general arrangement to verify general conformance with overall design concept of structure.
- .4 Design:
 - .1 Design floor deck (either composite or non-composite as indicated on Drawings) in conformance with CSSBI 12M, Articles 7.6 and 7.7 and CSSBI S3, for loading indicated on Drawings, including concentrated loads stipulated on the drawing and in NBC Table 4.1.6.B. Design deck for unshored conditions wherever possible.
 - .2 Limit floor deck deflections to the lesser of the following:
 - Live load L/360 or 20 mm
 - Total load L/240 or 20 mm
 - .3 Steel decking is to be rigid enough and connected sufficiently to provide lateral support for the top chord or flange of the supporting elements.
 - .4 Design floor deck and fastenings, including side lap fastening, for diaphragm action and to resist shears shown on Drawings.
 - .5 Verification of design capacities by calculation to be made available on request.
- .5 Requirements of Regulatory Agencies:
 - .1 Fabricate and install floor deck, which forms part of a required fire rated system exactly as specified in Underwriter's Laboratories test design specification that validates required rating.
- .6 Tolerances:
 - .1 Comply with requirements of CSSBI 12M.

Steel Floor Deck

- .2 Lay and position floor deck within a tolerance of plus or minus 12 mm ($\frac{1}{2}$ ") from its location shown on the Drawings, relative to centreline of columns and building exterior lines.
- .7 Source Quality Control:
 - .1 Inspection and testing of materials and fabrication of Work of this Section, and field quality control specified elsewhere in this Section, may be performed by an Inspection and Testing Company appointed by Consultant.
 - .2 Review provided by Inspection and Testing Company does not relieve Contractor of his sole responsibility for quality control over Work. Performance or non-performance of Inspection and Testing Company shall not limit, reduce, or relieve Contractor of his responsibilities in complying with the requirements of the specification.
 - .3 Inspection and Testing Company shall be certified by Canadian Welding Bureau, to CSA W178.1, Category 1, Buildings.
 - .4 Welding inspectors and supervisors shall be certified by Canadian Welding Bureau to CSA W178.2.
 - .5 Payment for specified Work performed by Inspection and Testing Company will be made from cash allowance specified in Section 01 20 00.
 - .6 Provide access for inspection to all places where work is being done or stockpiled prior to shipment.

1.4 Submittals

- .1 Qualifications:
 - .1 Submit in writing evidence of qualification for welding under CWB.
- .2 Professional Liability Insurance:
 - .1 Submit proof of connection design engineer's professional liability insurance specified in paragraph 1.4.2.3.
- .3 Shop Drawings:
 - .1 Submit shop and erection drawings in accordance with Section 01 30 00 and as specified below. Copies of portions of the structural drawings will not be accepted as shop drawings.
 - .2 Each shop drawing submitted shall bear the seal and signature of Professional Engineer responsible for floor deck design.

Steel Floor Deck

- .3 Indicate: design loading, including diaphragm loads; concentrated loads required by OBC; concrete strength; material grade and thickness; zinc coating designation; UL fire rating and test design specification number if applicable; whether deck is inverted; required minimum bearing; layout of units; framing and supports; anchorages; size and spacing and type of fastening to meet diaphragm action; openings and their reinforcement; accessories; details of flashings or closures at openings and columns; edge forms to retain plastic concrete; and details of construction.
- .4 Prior to submission to Consultant, Contractor shall review all shop drawings. By this review, Contractor represents to have determined and verified all field measurements, site conditions, materials, catalogue numbers and similar data, and to have checked and coordinated each shop drawing with the requirements of Work and of Contract Documents. Contractor's review of each shop drawing shall be indicated by stamp, date and signature of the Contractor's representative.
- .5 At time of submission, Contractor shall notify Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.
- .6 Consultant will review and return shop drawings in accordance with an agreed schedule. Consultant's review is intended as an assistance to the Contractor and will be for conformity to design concept and for general arrangement, and shall not relieve Contractor of responsibility for errors and omissions in shop drawings or of responsibility for meeting all requirements of Contract Documents.
- .7 Contractor shall make changes in shop drawings, which Consultant may require, consistent with Contract Documents, and resubmit unless otherwise directed by Consultant. When resubmitting, Contractor shall notify Consultant in writing of revisions other than those requested by Consultant.
- .8 Fabrication and construction that commences prior to shop drawing review by the Consultant is at the Contractor's risk.
- .9 Submit shop drawings as follows:
 - 1 copy for review before any Work commences.
 - 1 additional copy of shop and erection drawings for distribution as directed by Consultant.
 - 1 copy of reviewed shop and erection drawings to Inspection and Testing Company.
- .10 Submit shop and erection drawings in accordance with Section 01 30 00.
- .4 Inspection Reports:
 - .1 Inspection and Testing Company shall:
 - .1 Base inspection and testing upon Contract Drawings, specifications and reviewed shop and erection drawings bearing Stantec review stamp.

Steel Floor Deck

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- .2 Report immediately to Consultant, by phone, any deviations from the Contract Drawings, giving recommendations for further testing deemed necessary. No modifications to be made or instructions given without prior approval of Consultant.
 - .3 Submit reports at least weekly when shop and site Work of this Section is in progress. At beginning of each report, state whether Contract Requirements have been met and list separately conditions not meeting requirements.
 - .4 Distribute inspection reports as follows:
 - 1 copy to Consultant.
 - 1 copy to Consulting Structural Engineer.
 - 1 copy to Contractor.
 - .5 Sign report by inspector who performs inspection, and describe progress of Work, deficiencies found and corrective actions taken.
 - .6 Include an ongoing deficiency list of outstanding items from previous reports, indicate date of first observation, comment on status and date of corrective action, and comment on status.
 - .7 Issue final report at end of the applicable phases of work signifying that work is in overall conformity with Contract Documents and reviewed shop drawings.

1.5 Storage and Handling

- .1 Deliver anchorages supplied under Work of this Section to those responsible for their installation, to the location they direct, and to meet construction schedule.
- .2 Exercise care in storing and handling materials of this Section. Handle and store floor deck so that no damage or corrosion is caused to stored or erected Work, or to other property.
- .3 Comply with requirements of CSSBI 12M, clause 7.11.
- .4 Co-ordinate Work of this Section with Work specified in other Sections for structural bearing members, and arrange to deliver and install steel floor deck in accordance with erection schedule of bearing members. Install steel floor deck at proper times to serve as safety planking during steel erection.

PART 2 – PRODUCTS

2.1 Materials

- .1 Sheet Steel:
 - To ASTM A653/A653M and CSA S136.
 - Grade “230” minimum
 - Base steel nominal thickness 0.76 mm (0.030”) or greater.

Steel Floor Deck

- Minimum zinc coating designation ZF75.
- .2 Zinc-Rich Paint: to CGSB Specification CAN/CGSB-1.181.

2.2 Fabrication

- .1 Fabricate floor deck in accordance with Drawings and specifications and reviewed shop drawings.
- .2 Comply with requirements of CSSBI 12M, Clause 5.
- .3 Provide sheet steel angles, curbs, cover plates, flashings at junctions of columns, openings and walls with concrete slabs, and similar locations to prevent leakage of concrete topping; cell closures; fasteners; stiffeners; and accessories as required.
- .4 Reinforcement for Openings:
- .1 Separate framing will be supplied under Work of Section 05 12 00 for holes with dimensions across flutes greater than 300 mm (12").
 - .2 Reinforce openings from 150 mm (6") to 300 mm (12") across flutes, with 51 x 51 x 6.4 mm (2" X 2" X ¼") structural steel angles in direction perpendicular to flutes at both ends of opening, and extended 450 mm (1'- 6") past each side of opening.
 - .3 Weld angles to deck with 25 mm (1") long welds on each side 150 mm (6") centres.
- .5 Composite Non-Cellular Floor Deck:
- .1 Provide bond between deck and concrete by deformations rolled into vertical webs.
 - .2 Profile as dimensioned in catalogue load tables.
 - .3 End Joints: swaged for 50 mm (2") overlap and to provide faces of deck in same plane.
 - .4 Invert deck where indicated on Drawings.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify and approve alignment and levels of supporting members before laying floor deck. Do not proceed with erection until conditions are made satisfactory.

3.2 Erection

- .1 Notify Consultant and Inspection and Testing Company a minimum of 24 hours prior to erecting any steel floor deck to allow for inspection.
- .2 Comply with requirements of CSSBI 12M, Clauses 6 and 7.8, and as specified herein.

Steel Floor Deck

- .3 Placing Floor Deck Units:
 - .1 Place units with cells aligned end to end and to provide a minimum bearing on structural steel members of 45 mm (1.75").
 - .2 Do not force units into place causing them to distort.
 - .3 Lap ends of non-cellular panels no less than 50 mm (2").
- .4 Cutting and Fitting:
 - .1 Cut and fit floor deck and accessories around projections through floor.
 - .2 Make cuts square with neatly trimmed edges.
- .5 Reinforcement:
 - .1 Reinforce all elements at top and bottom by a continuous web of sheet metal the same thickness as deck, where elements are cut longitudinally 50 mm (2") or more from a vertical web.
 - .2 Provide suitable deck support for all top edges of unsupported flutes where deck is trimmed parallel to flutes.
 - .3 Reinforce holes cut in floor deck in field as specified under article 2.2, Fabrication.
- .6 Studs:
 - .1 In accordance with CSA W59, Annex H.
 - .2 Weld stud shear connectors through steel deck to steel framing below.
- .7 Closures and Flashing:
 - .1 Install sheet metal closures to match steel floor deck material where indicated on Drawings and seal ends of cell raceways at junctions between deck, and columns, walls, openings, where deck panels change direction and similar locations.
 - .2 Install sheet metal flashing to contain concrete at edge of slab, columns, for side and end concrete forms at holes through floor and at perimeter of building and similar locations where other construction does not perform this function.
 - .3 Secure closures and flashing by either sheet metal screws or welding.

3.3 Field Quality Control

- .1 Inspection and Testing Company, when appointed as specified in Source Quality Control elsewhere in this Section, shall perform:
 - .1 Verification of grade of steel, deformations in composite deck sections, material thickness, depth and dimensions of profile and zinc coating thickness.

Steel Floor Deck

- .2 Verification that bearing, erection and fastening and, if applicable, special requirements for electrical raceways, comply with Contract Documents.
- .3 Verification of UL ratings.
- .4 General inspection of coating touch-up.

3.4 Coating Touch-Up

- .1 For deck surfaces permanently exposed to view in finished structure:
 - .1 After erection, wire brush, clean and paint welding areas, rust spots, and scratched or otherwise damaged areas of zinc coating on deck and shop-applied prime paint on structural members.
- .2 Apply two coats of zinc-rich paint to zinc coated areas specified above.
- .3 Apply one coat of prime paint to prime painted areas specified above. Verify that touch-up paint is same type as shop coat.

3.5 Defective Work

- .1 Variations in excess of specified tolerances, and failure of materials of workmanship to meet requirements of this specification, will be considered defective work performed by this Section
- .2 Replace defective Work, as directed by Consultant.
- .3 Replace bent, warped, dented, punctured or weld-perforated deck where exposed to view.
- .4 Contractor shall pay for additional inspection and testing, redesign, corrective measures, and related expenses if Work is deficient or fails to meet the shop or fieldwork drawing details. Costs for additional inspection, testing, review and redesign to be deducted from Contract Value.

END OF SECTION

Lateral Load-Bearing Cold-Formed Metal Framing

PART 1- GENERAL

1.1 Summary

.1 Section includes:

- .1 Lateral load-bearing cold-formed metal framing, including but not limited to metal studs, furring, at exterior assemblies subject to lateral and loads transferred by exterior cladding materials.
 - .1 Aluminum cladding.
 - .2 Ceramic cladding.
 - .3 Metal cladding.
 - .4 Soffit cladding.

1.2 Submittals

.1 Submit required submittals in accordance with Section 01 33 00.

.2 *Product* data sheets:

- .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.

.3 Shop drawings:

- .1 Submit engineered shop drawings, including design, connections and restraint of wall and soffit assemblies. Field review requirements to be supplemented to include the following:
 - .1 Checking that mill test reports are properly correlated to materials.
 - .2 Sampling fabrication and erection procedures for general conformity to requirements of the *Contract Documents*.
 - .3 Checking fabricated members against specified member shapes.
 - .4 Sample checking of screwed and bolted joints.
 - .5 Sample checking that tolerances are not exceeded during fit-up or erection.
 - .6 General review of field cutting and alterations required by other sections.
- .2 Include necessary shop details and erection diagrams. Indicate member sizes, locations thicknesses exclusive of coating, coatings and materials. Include connection details for attaching framing to itself and for attachment to the structure. Show splice details where permitted. Indicate dimensions, openings, requirements of related work and critical installation procedures. Show temporary bracing required for erection purposes.
- .3 Indicate design loads and design calculations, including horizontal and vertical reactions at connections to building structure for all load cases.

Lateral Load-Bearing Cold-Formed Metal Framing

1.3 Quality Assurance

.1 Qualifications:

.1 *Subcontractor:*

- .1 Has adequate equipment and skilled workers to perform it expeditiously.
- .2 Has successfully completed installations similar to that specified during a period of at least the immediate past 5 years.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Base design on limit states design principles using factored loads and resistances.
- .2 Specified lateral loads shall be in accordance with the building code for building classification - 'Post-Disaster Building'.
- .3 Specified lateral loads shall be in accordance with the building code. For wind load calculations, the reference velocity pressure, q , shall be based on a 1 in 50 probability of being exceeded in any one year.
- .4 Resistances and resistance factors shall be in accordance with the building code and CAN/CSA S136-16.
- .5 Conform to the requirements of fire rated assemblies which have been tested in accordance with CAN/ULC S101-14 and provide indicated fire resistance rating.
- .6 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines of bridging. Do not rely on collateral sheathing to help restrain member rotation and translation perpendicular to the minor axis. *Provide* bridging at 1525 mm (60") on centre maximum. Space bridging at equal intervals over the span length of the member.
- .7 Design anchorage and splice details for bridging.
- .8 Design for local loading due to anchorage of cladding and interior wall mounted fixtures.
- .9 Maximum flexural deflections under specified lateral loads shall conform to following:
 - .1 $L/360$ unless otherwise indicated.
 - .2 Metal framing supporting masonry veneer shall meet the requirements of CSA S304-14.
 - .3 Metal framing assemblies supporting non-metal material clad soffits: $L/720$.
- .10 Design components or assemblies to accommodate specified erection tolerances of the structure.
- .11 *Provide* head, sill and jamb members and connections to frame openings larger than 100 mm (3-15/16") in any dimension.
- .12 Limit free play and movement in connections perpendicular to the plane of the framing to ± 0.5 mm (0.019") relative to the building structure.

Lateral Load-Bearing Cold-Formed Metal Framing

- .13 Anchor top and bottom track to the structure at a maximum spacing of 813 mm (32") centre to centre. Closer spacing shall be required in accordance with design requirements.
- .14 Allow for movement of structure. Design end connections to accommodate floor/roof deflections such that framing is not loaded axially.
- .15 Connections between lightweight steel framing members shall be by bolts or sheet metal screws.
- .16 Resistances for sheet metal screws shall be based on manufacturer's lowest bound test values multiplied by appropriate resistance factor, given in CAN/CSA S136-16.
- .17 Exterior soffit framing systems shall be inclusive of horizontal framing, secondary framing members, lateral braces, suspension members, and any other elements subject to lateral loads and dead loads of soffit cladding systems.
- .18 Lateral load bearing metal framing include:
 - .1 Framing subjected to lateral loads.
 - .2 Steel bridging.
 - .3 Top and bottom track.
 - .4 Head and sill members and jamb framing for openings.
 - .5 Bridging and track connections.
 - .6 Top and bottom track connections to main structure including detailing to accommodate floor deflections.

2.2 Materials

- .1 Steel to conform to requirements of CAN/CSA S136-16 and be identified as to specification, type grade and mechanical properties.
 - .1 Minimum base steel thickness exclusive of coating shall be as follows:
 - .1 1.087 mm (0.0428"). Use greater stud thickness if required by the design criteria.
 - .2 Minimum thickness for clip angles shall be 1.367 mm (0.054"). Use greater clip angle thickness if required by the design criteria.
 - .2 Metal framing members forming part of exterior building envelope shall have a minimum coating of Z275 galvanizing in accordance with ASTM A924/A924M-22a. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of *Consultant*.
 - .3 Sheet metal screws shall have a minimum coating thickness of 0.008 mm (0.0003") of zinc. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of *Consultant*.
 - .4 Zinc rich paint for touching up damaged metallic coatings shall conform to CAN/CGSB 1.181-M99.
 - .5 Isolation strip; at exterior walls: Foam gasket; adhesive backed, closed cell vinyl foam strips, 3.2 mm thick, in width to suit steel stud size.

Lateral Load-Bearing Cold-Formed Metal Framing

- .6 Concrete anchors shall have a minimum coating thickness of 0.008 mm (0.00032") of zinc. Other coatings providing equal or better corrosion protection may be used.
- .7 Screws:
 - .1 Steel screws shall be equal to or exceed minimum diameter indicated on shop drawings.
 - .2 Penetration beyond joined materials shall be not less than 3 exposed threads.
 - .3 Thread types and drilling capability shall conform to manufacturer's recommendations.
 - .4 Screws covered by sheathing materials shall have low profile heads.

2.3 Fabrication

- .1 *Provide* cut-outs centred in webs of members to accommodate mechanical and electrical services. Effect of cut-outs on strength and stiffness of members shall be considered.
- .2 Steel thickness exclusive of coating shall be marked on each member by embossing, stamping with indelible ink or by colour coding.

PART 3 - EXECUTION

3.1 Erection

- .1 Erect lateral load-bearing metal framing true and plumb within specified tolerances.
- .2 Employ temporary bracing wherever necessary to withstand loads to which the structure may be subject during erection and subsequent construction.
 - .1 Leave temporary bracing in place as long as required for safety and integrity of structure.
 - .2 Erector shall verify that during erection a margin of safety consistent with the requirements of the building code and CAN/CSA S136-16.
- .3 Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- .4 Erection tolerances:
 - .1 For purposes of this section, camber is defined as deviation from straightness of a member or any portion of a member or any portion of a member with respect to its major axis.
 - .2 For framing, out of plumbness shall not exceed 1/500th of member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.
 - .3 Metal framing shall seat into top and bottom tracks. Gap between end of stud and web of track shall not exceed 4 mm (0.158").
 - .4 For track, camber shall not exceed 1/1000th of member length.
 - .5 Spacing of metal framing shall not be more than 3 mm (1/8") from design spacing. Cumulative error in spacing shall not exceed requirements of finishing materials.

Lateral Load-Bearing Cold-Formed Metal Framing

- .5 Make field measurements necessary to ensure proper fit of members.
- .6 Cutting of members may be by saw or shear. Torch cutting is not permitted.
- .7 Holes that are field cut into lightweight steel framing members shall conform to requirements of Paragraph 2.3.1 and 3.1.7.

END OF SECTION

Metal Fabrications

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Work of this section includes metal fabrications as set-out in the Metal Fabrications Schedule or as indicated.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Submit list of fabrications to be *Provided* as part of the work of this section.
- .3 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .4 Shop drawings:
 - .1 Include plans, sections and large scale details, and indicate components and methods of assembly, materials and their characteristics, fastenings, metal finishes, welds, and their structural characteristics relative to their purpose, and other fabrication information required.
 - .2 Indicate proposed *Place of the Work* connections and methods.
 - .3 Submit coordination drawings indicating locations of concealed grounds, cutouts, plates, and other required fabrications.
 - .4 Show relation to adjoining construction, details of outside and inside corners and door openings.

1.3 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit operation and maintenance data for incorporation into maintenance manual specified in Section 01 77 00.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*:
 - .1 Has adequate plant, equipment, and skilled tradespersons to perform work expeditiously.
 - .2 Has successfully completed installations similar to that required in the *Work* during a period of at least the immediate past 5 years.
- .2 Requirements of regulatory agencies: the work of this section that functions to resist forces imposed by dead and live loads shall conform to requirements of jurisdictional authorities.

Metal Fabrications

1.5 Delivery, Storage, and Handling

- .1 Label, tag or otherwise mark metal fabrications supplied for installation by other sections to indicate its function, location in building and shop drawing designation.
- .2 Protect work from damage during delivery, storage and handling.
- .3 Deliver work to location at the *Place of the Work* designated by *Contractor* and to meet requirements of construction schedule.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design, fabricate, and install work of this section in accordance with the building code and requirements of authorities having jurisdiction.
- .2 Welding:
 - .1 Steel: Weld components to conform to requirements of CSA W59-18, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-19 and CSA W55.3-08 (R2018) as applicable.
 - .2 Stainless steel: Weld components to conform to requirements of CSA W59-18 and ANSI/AWS D1.6/D1.6M-2017 as applicable, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-19.
- .3 Design assemblies and connections to withstand own dead load, live loads, super-imposed dead loads, and fabrication forces, without permanent distortions or deformation, to maximum allowable deflection of L/360, within the following construction tolerances:
 - .1 Maximum variation from plumb in vertical lines: 3.2 mm (1/8") in 3 m (10'-0").
 - .2 Maximum variation from level: 3.2 mm (1/8") in 9 m (30'-0").
 - .3 Maximum variation from straight: 3.2 mm (1/8") in 3 m (10'-0") under a 3 m (10'-0") straight edge.
 - .4 Maximum variation from angle indicated: 10 seconds.
 - .5 Tolerances shall be non-cumulative.
- .4 Ladders:
 - .1 Design and fabricate ladders to withstand own dead load, live loads, super-imposed dead loads, and stresses in accordance with Ontario Ministry of Labour Data Sheet 2-04.
 - .2 Ladder rungs shall have non slip surface.
 - .3 Provide door and lock to prevent unauthorized access.

2.2 Materials

- .1 General:
 - .1 Unless detailed or specified otherwise, standard *Products* will be acceptable if construction details and installation meet requirements of the *Contract Documents*.

Metal Fabrications

- .2 Include materials, *Products*, accessories, and supplementary parts necessary to complete assembly and installation of work of Section 05 50 00.
- .3 Incorporate only metals that are free from defects that are visible, or that impair strength or durability. Install only new metals that are of best quality, free from rust or waves and buckles, clean, straight, with sharply defined profiles.
- .2 Steel:
 - .1 Structural shapes, plate, bars: hot-rolled, in accordance with CSA G40.21-13, Grade 300W.
 - .2 Hollow structural sections: hot-formed, seamless, in accordance with CSA G40.21-13, Grade 350W, Class H.
 - .3 Mild sheet and strip: hot rolled, in accordance with ASTM A1011/A1011M-14.
 - .4 Cold rolled sheet: stretcher levelled, fully pickled, in accordance with ASTM A1008/A1008M-13, Grade CS Type A exposed, matte finish, dry, unless otherwise indicated.
 - .5 Steel pipe: in accordance with ASTM A53/A53M-12, Type E or S, Grade A or B, standard weight, Schedule 40 seamless black or AISI MT 1010/1015.
- .3 Stainless steel:
 - .1 Type 304 unless otherwise indicated.
 - .2 Stainless steel tubing: in accordance with ASTM A269/A269M-15a, Commercial Grade, seamless welded.
 - .3 Stainless steel sheet and plate: in accordance with ASTM A167-99(2009).
 - .1 Stainless steel plate with checker plate pattern where indicated.
 - .4 Stainless steel bar and angle: in accordance with ASTM A276/A276M-17.
 - .5 Stainless steel seamless pipe: in accordance with ASTM A312/A312M-17.

2.3 Accessories

- .1 Fasteners:
 - .1 Exposed fasteners to match the material surface on which they occur.
 - .2 For fastening steel: Zinc plated screws and bolts, and in accordance with ASTM A307-21, Type 304 stainless steel where exposed to exterior.
 - .3 For fastening stainless steel: Stainless steel 300 Series or stainless steel 400 Series.
 - .4 High strength bolts: in accordance with ASTM A325-14.
 - .5 Concrete anchors; exterior exposed to weather: embedded epoxy set anchors, unless otherwise indicated.
 - .1 Size: in accordance with manufacturer's written requirements and reviewed shop drawings. Embedment depth shall not be greater than 80% of concrete thickness.

Metal Fabrications

- .6 Other types of fasteners as appropriate to meet design requirements.
- .7 Fasteners shall be tamperproof where exposed.
- .2 Welding materials:
 - .1 Steel: in accordance with CSA W59-18.
 - .2 Stainless steel: in accordance with ANSI/AWS D1.6/D1.6M-2017.
- .3 Grout:
 - .1 Epoxy grout; non-shrink, non-expanding.
 - .1 Acceptable *Products*:
 - .1 Hilti 'HY-200'.
 - .2 Sika 'Sika AnchorFix 3001'.
 - .3 W.R. Meadows 'REZI-WELD 3/2 EPOXY GROUT/PATCH'.
 - .4 Substitutions: in accordance with Section 01 25 00.
 - .2 Cementitious grout: non-shrink, non-expanding in accordance with ASTM C1107/C1107M-20:
 - .1 Acceptable *Products*:
 - .1 Sika 'Sika Grout 212' or 'Sika M-Bed Standard'.
 - .2 W.R. Meadows 'Sealtight CG-86 Construction Grout'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Dielectric separator: Best grade, quick drying non-staining alkali resistant bituminous paint in accordance with CAN/CGSB 1.108-M89, or membrane type to acceptance of *Consultant*.

2.4 Finishes

- .1 Zinc rich paint; steel: Two-component zinc-rich coating, zinc powder to ASTM D520-00(2019) Type III, SSPC-Paint 20, Type 1 Inorganic or single-component zinc-rich coating to SSPC-Paint, Type 2 Organic, CAN/CGSB 1.181-M99, VOC content <100 g/l to ASTM-D1475.
- .2 Hot dip galvanizing: conforming to ASTM A123/A123M-13, minimum zinc coating of 600 g/m². Use air cooling method (no water or chromate dipping treatment permitted).
 - .1 Provide hot dip galvanized finish to steel fabrications located to the exterior of building envelope.
- .3 Prime paint: CISC/CPMA 2-75, grey colour.
- .4 Stainless steel: in accordance with AISI No. 4 brushed finish.
- .5 Powder paint:
 - .1 Acceptable *Products*:

Metal Fabrications

- .1 Tiger Drylac series 49 (polyester TGIC), two coat system including coloured base coat and clear top coat.
- .2 Colour:
 - .1 To later selection by *Consultant* from manufacturer's standard range.
- .6 Field painting: in accordance with Section 09 91 00.

2.5 Fabrication

- .1 General:
 - .1 Fabricate metal fabrications with machinery and tools specifically designed for the intended manufacturing processes and by skilled tradesmen.
 - .2 Fit and assemble metal fabrications in shop. When this is not possible, make a trial shop assembly.
 - .3 Incorporate means for fastenings of other work secured to work of this section.
- .2 Construction:
 - .1 Fabricate with materials, component sizes, metal gauges, reinforcing, anchors, and fasteners of adequate strength to withstand intended use, and within allowable design factors imposed by jurisdictional authorities. Fabricate items from steel unless otherwise noted.
 - .2 Metal fabrications shall remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation.
 - .3 Construct items that are part of floor construction, such as gratings and trench covers, to support the same live loads for which surrounding construction is designed.
 - .4 Non-galvanized steel fabrications at exterior locations: *Provide* drainage holes at exterior exposed tubular fabrications to permit drainage of moisture to exterior of metal fabrications.
- .3 Assembly:
 - .1 Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes.
 - .2 Provide smooth welds with splatter removed where exposed to view.
 - .1 Finish welds shall comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter as shown in NAAMM-AMP 521-01(R2012).
 - .3 Allow for differential movements within assemblies and at junctions of assemblies with surrounding *Work*.
 - .4 Incorporate holes and connections for work installed under other sections.
 - .5 Cleanly and smoothly finish exposed edges of materials including holes.
 - .6 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work.

Metal Fabrications

- .4 Galvanizing:
 - .1 Galvanize metal fabrications following fabrication.
 - .2 Paint damage galvanized surfaces with zinc rich paint, immediately following damage to galvanized protection. Prepare substrate to remove oil and grease to SSPC-SP1-16, rust scale to SSPC-SP3-18, mill scale to SSPC-SP6.
 - .3 Fill vent and drain holes that are exposed in the finished *Work*, unless indicated to remain as weep holes in exterior fabrications, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

3.1 Examination

- .1 Take measurements at the *Place of the Work* to verify that metal fabrications fit surrounding construction, around obstructions and projections in place, or as indicated, and to suit service locations.

3.2 Installation

- .1 Install metal fabrications plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding work.
- .2 Include in work of this section anchor bolts, high tensile bolts, washers and nuts, expansion bolts, toggles, straps, sleeves, brackets, clips, and other items necessary for secure installation as required by loading and jurisdictional authorities.
- .3 Countersink holes at wood screw locations where wood is attached to work of this section.
- .4 Attach metal fabrications to interior concrete and masonry with corrosion resistant expansion bolts to support load with a safety factor of 3.
- .5 Attach metal fabrications to exterior concrete and masonry with non-shrink epoxy cement to support load with a safety factor of 3.
- .6 Insulate between dissimilar metals or between metal, and masonry or concrete with bituminous paint to prevent electrolytic action.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Install roof ladders to suit locations indicated complete with safety cages where required. Galvanized finish. Reinforce walls as required to receive roof ladders.
- .9 Through bolt or cast-in ladder anchorage assemblies unless otherwise approved by authorities having jurisdiction.
- .10 Field painting: in accordance with Section 09 91 00.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Inspection and testing:

Metal Fabrications

- .1 Test stainless steel for free iron in accordance with ASTM A380/A380M-17. If test results or inspections show stainless steel work to be contaminated with free iron or other impurity which can lead to discolouration of stainless steel work when exposed to moisture, remove and replace or repair the stainless steel work in accordance with recommendation of Nickel Development Institute and as required to provide stainless steel which meets the requirements of this section.

3.4 Adjusting and Cleaning

- .1 After erection, touch up primed surfaces that are burned, scratched or otherwise damaged with prime paint to match shop paint.
- .2 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.

3.5 Metal Fabrications Schedule

- .1 Metal concrete filled bollards, hot dip galvanized. Finish painting coats shall be provided in accordance with Section 09 91 00.
- .2 Overhead door supports and frames; hot dip galvanized. Finish painting coats shall be provided in accordance with Section 09 91 00.
- .3 Bariatric washroom fixtures and accessory supports, including but not limited to the following:
 - .1 Grab bars.
 - .2 Provision for support for adult change table.
 - .3 Baby change table.
- .4 Miscellaneous steel supports as indicated on Drawings. Finish: Galvanized.
- .5 Roof access ladders: Hot dip galvanized steel finish, no further finish required. Non-slip surface.
- .6 Metal stairs. Finish: Galvanized.
- .7 Handrail and guardrails.
 - .1 RL1: removable metal handrail.
 - .1 Colour: Bright yellow.
 - .2 RL2: metal handrail.
 - .1 Finish: Galvanized.
- .8 Lintels.
- .9 Channel door frames. Finish: Galvanized.
- .10 Steel ladders and safety cages. Finish: Galvanized.
- .11 Overhead coiling grille and door jamb and head plate.
 - .1 Colour: White.

Metal Fabrications

- .12 Metal grate platform. Finish: Galvanized.
- .13 Angles at pits and openings. Finish: Galvanized.
- .14 Steel framing and supports for the following:
 - .1 Masonry lateral support angles. Finish: Galvanized, paint to match adjacent.
 - .2 Shelf angles. Finish: Galvanized, paint to match adjacent.
 - .3 Canopies. Finish: Galvanized.
 - .4 Vanity and millwork supports. Finish: Galvanized.
 - .5 Overhead coiling shutter.
 - .1 Finish: Galvanized.
 - .2 Colour: White.
 - .6 Overhead door supports.
 - .1 Finish: Galvanized.
 - .2 Colour: White.
 - .7 Suspended toilet partitions and cubicles.
 - .1 Finish: Galvanized.
 - .2 Colour: to later selection by *Consultant*.
 - .8 Bench supports.
 - .1 Finish: Galvanized.
 - .2 Colour: to later selection by *Consultant*.
 - .9 Miscellaneous steel brackets, supports, and angles. Finish: Galvanized.
 - .10 Miscellaneous steel support for wall and ceiling mounted furniture and equipment for items both In Contract and Not in Contract.
 - .1 Finish: Galvanized.
 - .11 Sheet steel wall reinforcement for both In Contract and Not in Contract furniture and equipment.
 - .1 Finish: Galvanized.
 - .12 Adult change table support. Finish: Galvanized.
 - .13 Enhanced washroom grab bar support. Finish: Galvanized.
 - .14 Sliding door support. Finish: Galvanized.
 - .15 Glass wall support hangers and brace.
 - .16 Horizontal shaftwall support. Finish: Galvanized.
 - .17 Top of partition bracing (Level 1 and 3). Finish: Galvanized.
 - .18 Ceiling support structure (Level 1 and 3). Finish: Galvanized.
 - .19 Metal grate platform support framing, Galvanized.

Metal Fabrications

- .20 Threshold supports: Minimum 9 mm thick stainless steel formed angles. Finish: Galvanized.
- .21 Exterior steel gate (ambulance parking).
 - .1 Finish: Galvanized, painted Black.

END OF SECTION

Architectural Metal Fabrications

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Work of this section includes architectural metal fabrications as set-out in the Architectural Metal Fabrications Schedule or as indicated.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Submit a list of fabrications to be *Provided* as part of the work of this section.
 - .3 Include plans, sections and large scale details, exposed-to-view edge conditions.
 - .4 Indicate materials, including material characteristics, profiles of each metal fabrication member, methods of assembly and joinery, fittings, fastenings, finishes, anchorages, welds, solders, brazing, and their structural characteristics relative to their purpose, accessory items, and other fabrication information required.
 - .5 Indicate proposed *Place of the Work* connections and methods.
 - .6 Submit coordination drawings indicating locations of concealed grounds, cutouts, plates, and other required fabrications.
 - .7 Show relation to adjoining construction, details of outside and inside corners and door openings.
- .4 Samples:
 - .1 Submit 3 sets of samples of architectural metals and shop finished materials, show each type of finish and colour, 200 mm x 200 mm (8" x 8") size.
 - .2 Provide samples of welded joints showing quality of workmanship.
 - .3 Provide fastener samples for each type required.
- .5 Certificates: mill certificates signed by manufacturers of stainless steel certifying that products furnished comply with requirements.

Architectural Metal Fabrications

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Manual shall include detailed maintenance and cleaning procedure for materials and finishes requiring specific care, noting particularly those procedures or materials which will cause damage to finished surfaces.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:
 - .1 *Subcontractor*, shop foreperson, and *Place of the Work* installation foreperson:
 - .1 Have adequate plant, equipment, and skilled tradespersons to perform work expeditiously.
 - .2 Has successfully completed installations similar to that specified during a period of at least the immediate past 10 years.
 - .3 Fabricators shall have experience working with all metal types specified in this section.
 - .2 Provide separation of stainless steel or non-ferrous metals fabrication areas from mild steel fabrication areas.
 - .3 Grinders, wire brushes, and tools used on stainless steel or non-ferrous metals shall be free of materials which will leave or produce dissimilar material or metal oxides deposits. Tools previously used on mild steel shall not be used on stainless steel or non-ferrous metal work.
 - .4 Do not bring iron or mild steel surfaces into contact with stainless steel or non-ferrous metals, including lifting tools, steel tables, storage racks, and other storage and handling equipment.
 - .5 Cutting or grinding debris from iron or mild steel materials shall not be permitted to settle on stainless steel or non-ferrous materials and fabrications.
 - .6 Perform water-wetting and drying tests during finishing indicating free iron on finished stainless work in accordance with ASTM A380-06.

1.6 Delivery, Storage, and Handling

- .1 For aluminum fabrications comply with AAMA CW-10 – Care and Handling of Architectural Aluminum from Shop to Site.
- .2 Label, tag or otherwise mark work supplied for installation by other sections to indicate its function, location in building and shop drawing designation.
- .3 Metals subject to corrosion during handling and storage shall be protected from exterior and adverse conditions to preserve finish.
- .4 Deliver work to location at the *Place of the Work* designated by *Contractor* and to meet requirements of construction schedule.

Architectural Metal Fabrications

- .5 For metalwork items which are susceptible to damage from construction activities provide strippable temporary protective film on factory finished or prefinished surfaces before shipping.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design, fabricate, and install work of this section in accordance with the building code and requirements of authorities having jurisdiction.
- .2 Welding:
 - .1 Steel: Weld components to conform to requirements of CSA W59-18, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-19 and CSA W55.3-08 (R2018) as applicable.
 - .2 Stainless steel: Weld components to conform to requirements of CSA W59-18 and ANSI/AWS D1.6/D1.6M-2007 as applicable, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-19.
 - .3 Aluminum: Weld components to conform to requirements of CSA W59.2-18, and by a fabricator certified by the Canadian Welding Bureau to conditions of CSA W47.2-11(R2020).
- .3 Design assemblies and connections to withstand own dead load, super-imposed dead loads, live load, and fabrication forces, without permanent distortions or deformation, to maximum allowable deflection of L/360, within the following construction tolerances:
 - .1 Edges and surfaces shall be uniform for like metalwork.
 - .2 Limit inconsistencies in edge and surfaces to those which can be identified when viewed from distance of not greater than 300 mm (12").
 - .3 Surfaces of panels shall be flat and free of distortion when viewed from any distance or angle from surface.
 - .4 Finish shall be uniform when viewed from any distance from surface or from like surfaces which are viewed from within the same viewing area.
 - .5 Limit variations from plumb and level:
 - .1 3.2 mm in 6096 mm (1/8" in 20'-0") vertically and horizontally.
 - .2 6.4 mm in 12192 mm (1/4" in 40'-0") either direction.
 - .6 Limit offsets in theoretical end-to-end and edge-to-edge alignment:
 - .1 1.6 mm (1/16") where surfaces are flush or less than 12.7 mm (1/2") out of flush and separated by not more than 50 mm (2").
 - .2 3.2 mm (1/8") for surfaces separated by more than 50 mm (2").
 - .7 Step in face: 1.6 mm (1/16") maximum.
 - .8 Jog in alignment: 1.6 mm (1/16") maximum.
 - .9 Location: 6.4 mm (1/4") maximum deviation of any member at any location.

Architectural Metal Fabrications

.10 Tolerances are not cumulative.

- .4 Comply with NAAMM AMP 555-92 – Standard Practice for the Architectural Metal Industry (Including Miscellaneous Iron).

2.2 Materials

.1 General:

- .1 Unless detailed or specified otherwise, standard *Products* will be acceptable if construction details and installation meet requirements of the *Contract Documents*.
- .2 Include materials, *Products*, accessories, and supplementary parts necessary to complete assembly and installation of work of Section 05 50 10.
- .3 Incorporate only metals that are free from defects that are visible, or that impair strength or durability. Install only new metals that are of best quality, free from rust or waves and buckles, clean, straight, with sharply defined profiles.

.2 Steel:

- .1 Structural shapes, plate, bars: hot-rolled, in accordance with CSA G40.21-13, Grade 300W.
- .2 Hollow structural sections: hot-formed, seamless, in accordance with CSA G40.21-13, Grade 350W, Class H.
- .3 Mild steel sheet and strip: hot rolled, in accordance with ASTM A1011/A1011M-14, Commercial.
- .4 Cold rolled sheet: stretcher levelled, fully pickled, in accordance with ASTM A1008/A1008M-13, Grade CS Type A exposed, matte finish, oiled, unless otherwise indicated.
- .5 Steel pipe: in accordance with ASTM A53/A53M-12, Type E or S, Grade A or B, standard weight, Schedule 40 seamless black or AISI MT 1010/1015.

.3 Stainless steel:

- .1 Type 304 unless otherwise indicated.
- .2 Stainless steel tubing: in accordance with ASTM A269/A269M-15a, Commercial Grade, seamless welded.
- .3 Stainless steel sheet and plate: in accordance with ASTM A167-99(2009).
- .1 Stainless steel plate with checker plate pattern where indicated.
- .4 Stainless steel bar and angle: in accordance with ASTM A276/A276M-17.
- .5 Stainless steel seamless pipe: in accordance with ASTM A312/A312M-17.

.4 Aluminum:

- .1 Aluminum extrusions: Alloy 6063-T5 or T6 to ANSI H35.1/H35.1M-2017.
- .2 Aluminum sheet: Aluminum alloy 5005H14 to ANSI H35.1/H35.1M-2017. Exposed sheet shall be machine flattened free of distortions, resquared sawcut edges.

.5 Perforated aluminum screens:

Architectural Metal Fabrications

- .1 Panel size: varies, to suit design requirements as indicated on the drawings.
- .2 Thickness: 4.8 mm (3/16").
- .3 Openness: 25% - 30%.
- .4 Holes: round, 15 mm (0.0625") diameter.
- .5 Pattern: spaced 27 mm (0.109") staggered centres.
- .6 Finish: powder coated, to later selection by *Consultant*.

2.3 Accessories

- .1 Fasteners:
 - .1 Exposed fasteners to match the material surface on which they occur.
 - .2 For fastening steel: Zinc plated screws and bolts, and in accordance with ASTM A307-21, Type 304 stainless steel where exposed to exterior.
 - .3 For fastening stainless steel: same metal as that being fastened. Match finish of exposed heads with material being fastened.
 - .4 For fastening aluminum: Stainless steel 300 Series, stainless steel 400 Series, cadmium plated or aluminum.
 - .5 High strength bolts: in accordance with ASTM A325-14.
 - .6 Concrete anchors; exterior exposed to weather: embedded epoxy set anchors, unless otherwise indicated.
 - .1 Size: in accordance with manufacturer's written requirements and reviewed shop drawings. Embedment depth shall not be greater than 80% of concrete thickness.
 - .7 Other types of fasteners as appropriate to meet design requirements.
 - .8 Fasteners shall be tamperproof where exposed.
- .2 Welding materials:
 - .1 Steel: in accordance with CSA W59-18.
 - .2 Stainless steel: in accordance with ANSI/AWS D1.6/D1.6M-2017.
 - .3 Aluminum: in accordance with CSA W59.2-18.
- .3 Grout:
 - .1 Epoxy grout; non-shrink, non-expanding.
 - .1 Acceptable *Products*:
 - .1 Hilti 'HY-200'.
 - .2 Sika 'Sika AnchorFix 3001'.
 - .3 W.R. Meadows 'REZI-WELD 3/2 EPOXY GROUT/PATCH'.
 - .2 Cementitious grout: non-shrink, non-expanding to ASTM C1107/C1107M-20:
 - .1 Acceptable *Products*:

Architectural Metal Fabrications

- .1 Sika 'Sika Grout 212' or 'Sika M-Bed Standard'.
- .2 W.R. Meadows 'Sealtight CG-86 Construction Grout'.
- .3 Substitutions: in accordance with Section 01 25 00.
- .4 Dielectric separator: Best grade, quick drying non-staining alkali resistant bituminous paint in accordance with CAN/CGSB 1.108-M89, or membrane type to acceptance of *Consultant*.
- .5 Z-girts; for installation of perforated metal screens: 1.2 mm thick (18 gauge) steel, powder paint finish to match colour of panels. Paint out fasteners at *Place of the Work*.

2.4 Finishes

- .1 Shop primer; premium quality:
 - .1 Acceptable *Product*:
 - .1 Sherwin Williams 'Pro Industrial Pro-Cryl Universal Primer', 0.0076 mm (3 mils) DFT.
- .2 Zinc rich paint; steel: Two-component zinc-rich coating, zinc powder to ASTM D520-00(2019) Type III, SSPC-Paint 20, Type 1 Inorganic or single-component zinc-rich coating to SSPC-Paint, Type 2 Organic, CAN/CGSB 1.181-M99, VOC content <100 g/l to ASTM-D1475.
 - .1 Acceptable *Products*:
 - .1 Aervoe Industries, Inc. 'Low VOC Cold Galvanize Coating 93% Zinc'.
 - .2 ZRC Worldwide 'ZRC Zero-VOC Galvanizing Compound'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .3 Hot dip galvanizing: for irregular sections, in accordance with ASTM A123/A123M-13, minimum zinc coating of 600 g/m². Use air cooling method (no water or chromate dipping treatment permitted).
- .4 Stainless steel:
 - .1 AISI No. 4 brushed finish.
- .5 Aluminum:
 - .1 Colour anodized in accordance with AA Designation AA-M12C21A44 or AA-M12C22A44 (Class I).
 - .1 Colour: to later selection by *Consultant*.
- .6 Field painting: in accordance with Section 09 91 00.

2.5 Fabrication

- .1 General:
 - .1 Fabricate architectural metal fabrications with machinery and tools specifically designed for the intended manufacturing processes and by skilled tradesmen.

Architectural Metal Fabrications

- .2 Fit and assemble architectural metal fabrications in shop. When this is not possible, make a trial shop assembly.
- .3 Incorporate means for fastenings of other work secured to work of this section.
- .2 Construction:
 - .1 Fabricate with materials, component sizes, metal thicknesses (gauges), reinforcing, anchors, and fasteners of adequate strength to withstand intended use, and within allowable design factors imposed by jurisdictional authorities. Fabricate items from steel unless otherwise noted.
 - .2 Architectural metal fabrications shall remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation to expansion and contraction forces and loads.
 - .3 Construct items that are part of floor construction, such as gratings and trench covers, to support the same live loads for which surrounding construction is designed.
 - .4 Non-galvanized steel fabrications at exterior locations: *Provide* drainage holes at exterior exposed tubular fabrications to permit drainage of moisture to exterior of metal fabrications.
- .3 Assembly:
 - .1 Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes.
 - .2 Corners shall be mitred unless otherwise noted.
 - .3 Fasten work with concealed methods unless otherwise indicated.
 - .4 Weld connections where possible, bolt where not possible, and cut off bolts flush with nuts. Countersink bolt heads, and *Provide* method to prevent loosening of nuts. Ream holes drilled for fastenings.
 - .1 Except where exposed to view:
 - .1 Finish welds shall comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #4 - Good quality, uniform undressed weld with minimal splatter as shown in NAAMM AMP 521.
 - .2 Where exposed to view:
 - .1 Weld behind finished surfaces without distorting or discolouring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Joint Finish Guidelines", for "Finish #1 - no evidence of a welded joint".
 - .5 Allow for differential movements within assemblies and at junctions of assemblies with surrounding work.
 - .6 Field welding of hot dipped galvanized members permitted only when other fastening methods are not possible. Locations of field welds to be clearly identified on shop drawings.

Architectural Metal Fabrications

- .7 Incorporate holes and connections for work installed under other sections.
- .8 Cleanly and smoothly finish exposed edges of materials including holes.
- .9 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work.
- .4 Shop prime painting; premium quality:
 - .1 Clean loose mill scale, rust, dirt, weld flux and spatter from work after fabrication.
 - .2 Clean and prepare surfaces to meet specified requirements of SSPC SP-6 and paint manufacturer's installation requirements.
 - .3 Apply primer in accordance with paint manufacturer's installation requirements.
- .5 Galvanizing:
 - .1 Galvanize metal fabrications following fabrication.
 - .2 Paint damaged galvanized surfaces with zinc rich paint, immediately following damage to galvanized protection. Prepare substrate to remove oil and grease to SSPC-SP1-16, rust scale to SSPC-SP3-18, mill scale to SSPC-SP6/NACE No. 3-07.
 - .3 At exterior locations, except where indicated to remain as weep holes, fill vent and drain holes exposed in the finished *Work* by plugging with zinc solder and filing off smooth.
- .6 Fabrications exposed to view:
 - .1 Fabrications exposed to view shall be of the highest architectural quality, free of scratches, pitting, roughness, marring, discolouration, seams, staining and other imperfections with the quality of workmanship conforming to the workmanship classifications of Class 1 as defined in NAAMM-AMP 555-92, paragraph 8.3 of Section 8, Quality Control or Assurance and as follows:
 - .1 Exposed surfaces are finished smooth with pits, mill marks, nicks and scratches filled or ground off. Defects shall not show when painted or polished. Remove sharp corners and edges.
 - .2 Conceal welds where possible. Where exposed, grind welds to small radius with uniform sized cove. Welds shall appear continuous in appearance. When painted or polished welds shall be undetectable.
 - .3 Use only flat head countersunk bolts in exposed locations unless indicated otherwise.
 - .4 Distortions shall not be visible to the eye.
 - .5 Exposed joints shall be fitted to hairline finish.
 - .2 Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

Architectural Metal Fabrications

- .3 Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- .4 Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the work.
- .5 Form simple and compound curves in bars, pipe, tubing, and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.
- .6 Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1 mm (0.040") unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- .7 Mill joints to a tight, hairline fit. Cope or mitre corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- .8 Surface preparation; non-ferrous metals: Remove tool and die marks and stretch lines, or blend into finish. Grind and polish surfaces to produce uniform finish, free of cross scratches. Run grain of directional finishes with long dimension of each piece.

PART 3 - EXECUTION

3.1 Examination

- .1 Take measurements at the *Place of the Work* to verify that architectural metal fabrications fit surrounding construction, around obstructions and projections in place, or as indicated, and to suit service locations.
- .2 Inspect surfaces on which work of this section is dependent for any irregularities detrimental to installation and performance of the work of this section. Confirm conditions are satisfactory before proceeding.

3.2 Installation

- .1 Install work plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding Work and as required for proper performance.
- .2 Supply and install anchor bolts, high tensile bolts, washers and nuts, expansion bolts, toggles, straps, sleeves, brackets, clips, and other items necessary for secure installation as required by loading and jurisdictional authorities.
- .3 Countersink holes at wood screws where wood is attached to work of this section.
- .4 Attach metal fabrications to exterior concrete and masonry with non-shrink epoxy grout to support load with a safety factor of 3.
- .5 Insulate between dissimilar metals, between metal and masonry, and between metal and concrete with bituminous paint to prevent electrolytic action.
- .6 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

Architectural Metal Fabrications

- .7 Erect members and component parts plumb, level and true to building lines, in correct relation to work of other sections and established lines, curves and levels indicated.
- .8 Securely anchor metal framing to concrete by means of anchor rods with epoxy adhesive, shim and pack to true straight lines and levels.
- .9 Field welding:
 - .1 Comply with applicable specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections given above in this section.
 - .2 Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- .10 Mount perforated steel panels vertically on z-girts at 610 mm (24") on centre and perimeter.
- .11 Field painting: in accordance with Section 09 91 00.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and as follows:
 - .1 Inspection and testing:
 - .1 Ferroxyl test for free iron in accordance with ASTM A380/A380M-17 in the fabrication shop and on site.
 - .2 If test results or inspections show stainless steel work to be contaminated with free iron or other impurity which can lead to discolouration of stainless steel work when exposed to moisture, remove and replace or repair the stainless steel work in accordance with recommendation of Nickel Development Institute and as required to provide stainless steel which meets the requirements of this section.

3.4 Adjusting and Cleaning

- .1 After erection, touch up primed surfaces that are burned, scratched or otherwise damaged with prime paint to match shop paint.
- .2 Repair areas of bare metal and welds on galvanized surfaces with zinc rich paint.
- .3 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.
- .4 Clean and polish surfaces after installation is complete. Use only materials that will not scratch or mar finished surfaces and as approved by material manufacturers.

3.5 Architectural Metal Fabrications Schedule

- .1 Stainless steel base:
 - .1 Finish: No. 4 stainless steel finish.

END OF SECTION

Modular Workplace Guardrail System

1 GENERAL

1.1 Definitions

- .1 Application Specialist: An individual who performs surface preparation and application of protective coatings and linings to steel and concrete surfaces of complex industrial structures.

1.2 Reference Standards

- .1 American National Standard / American Society of Safety Engineers (ANSI/ASSE):
 - .1 ANSI/ASSE A1264.1-2007 Safety Requirements for Workplace Walking/Working Surfaces and their Access; Workplace, Floor, Wall and Roof Openings; Stairs and Guardrail Systems.
- .2 ASTM International (ASTM)
 - .1 A27/A27M-13 Standard Specification for Steel Castings, Carbon, for General Application
 - .2 ASTM A 47-99(2014), Standard Specification for Ferritic Malleable Iron Castings.
 - .3 ASTM A 53/A 53M 02, Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless.
 - .4 ASTM A 153/A 123M-16, Standard Specification for Zinc (Hot-Dip) Coatings on Iron and Steel Hardware.
 - .5 ASTM A 500-13 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - .6 ASTM B 221M-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
 - .7 ASTM B 429//B241M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 - .8 ASTM E 935-13e1, Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-2015, Paints, Coatings, Stains and Sealers.

Modular Workplace Guardrail System

- .4 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards.
 - .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
- .6 NACE International
 - .1 NACE International
 - .1 ANSI/NACE No. 13/SSPC-ACS-1-2016-SG, Industrial Coating and Lining Application Specialist Qualification and Certification.

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 handrails and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit manufacturer's installation instructions with project specific annotations to suit project conditions.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - .3 Indicate installation of handrails and guardrails including but not limited to plans, elevations, sections, details of components, anchor details, toe boards, and clearances to adjacent assemblies. Indicate critical field dimensions and conflicts.
 - .4 Indicate installation conditions at obstructions or at junction with adjacent construction as necessary to provide continuity of protection.

Modular Workplace Guardrail System

.4 Samples:

- .1 Submit for review and acceptance of each unit.
- .2 Samples will be returned for inclusion into work.
- .3 Submit 2, 200 mm long samples of handrail and typical fittings complete with specified finish.
- .4 Submit 2 complete sets of colour chips showing manufacturer's complete range of finishes.

.5 Parts List:

- .1 Submit parts list indicating manufacturer's name, part number and name, quantity required for complete installation.

.6 Certificates:

- .1 Submit certification that modular guardrail system has been tested in accordance with ASTM E 935, that it conforms to requirements of ANSI/ASSE A1264.1 and to workplace safety requirements of authority having jurisdiction.
- .2 Submit certifications for Application Specialists to demonstrate compliance to the requirements of ANSI/NACE No.13.

1.4 Maintenance Material

- .1 Furnish maintenance material at a rate of 2% of number of each installed component.
- .2 Deliver to site in sealed packaging labeled with manufacturer's name, component part number corresponding to installed products list. Store where directed.

1.5 Quality Assurance

- .1 Modular guardrail system shall be the standard product of a manufacturer regularly engaged in the engineering design and manufacture of such products. System shall consist of components that have been in satisfactory use for at least 2 years prior to date of tender issue.
- .2 Qualifications:
 - .1 Ensure that 50% of industrial coating and lining applications specialists, who perform concrete and steel surfaces preparation and coating applications, are certified by a recognized Applicator Certification Agency, in accordance with NACE 13 /SSPC ACS-I, Applicator Certification Standard (ACS).

Modular Workplace Guardrail System

- .2 Maintain a current and valid ACS certification during project period.
 - .1 Application specialists who perform surface preparation and coating application work on this project must have a current ACS.
- .3 Notify Consultant of any change in application specialist certification status.
 - .1 Any delays to the completion of the Project due to invalid certifications will not be considered, and liquidated damages shall not be waived for any non-performance by Contractor.

1.6 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver products to site in original factory packaging, labelled with manufacturer's name and address, and list of contents of each package.
 - .2 Inspect products for any damage or deformation. Remove damaged products from site and replace with matching undamaged products.
 - .3 Check package contents list against submitted parts list to ensure all components necessary for a complete installation have been delivered.
- .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 guardrail components from all damage. Protect finish from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Construction and packaging waste management: in accordance with Section 01 74 19 - Waste Management and Disposal.

Modular Workplace Guardrail System

2 PRODUCTS

2.1 Design Criteria

- .1 Installed guardrail assembly and anchorage shall conform to ANSI/ASSE A1264.1, structural requirements of NBC 2015 and workplace safety requirements of applicable jurisdiction.
 - .1 In case of conflicting requirements, the more stringent requirement shall apply.

2.2 Modular Steel Guardrail System

- .1 Fittings: elbows, T-shapes, wall flanges, couplings, machined steel castings to ASTM A 27 with locking stainless steel set screws.
- .2 Permanent Mounting: pre-fabricated base component complete with anchors to suit installation conditions in accordance with accepted shop drawings.
- .3 Non-Penetrating Anchorage for Rooftop or Freestanding Installation: weighted base mounting plate with non-abrasive non-slip resilient pad, with integral receivers to secure and fasten posts.
- .4 Exposed Fasteners: flush countersunk screws or bolts; consistent with design of railing.
- .5 Splice Connectors: steel concealed spigots, welding collars or threaded collars.
- .6 Galvanizing: to ASTM A 153, provide minimum [600] g/m² galvanized coating.
 - .1 Touch-Up Primer for Galvanized Surfaces: SPCC 20 Type I Inorganic, Type II Organic, zinc rich.

2.3 Modular Aluminum Guardrail System

- .1 Rails: 38 mm diameter, tube or pipe to ASTM B221M or B429.
- .2 Posts: [38] mm diameter, tube or pipe to ASTM B221M or B429, vertical profile.
- .3 Fittings: elbows, T-shapes, wall brackets, escutcheons; cast aluminum, with locking stainless steel set screws.
- .4 Splice Connectors: concealed spigot, collar with locking set screws, welding collars; cast aluminum.

Modular Workplace Guardrail System

- .5 Exposed Fasteners: flush countersunk screws or bolts; consistent with design of railing.
- .6 Permanent Mounting: pre-fabricated base component complete with anchors to suit installation conditions in accordance with accepted shop drawings.
- .7 Non-Penetrating Anchorage for Rooftop or Freestanding Installation: weighted base mounting plate with non-abrasive non-slip resilient pad, with integral receivers to secure and fasten posts.
- .8 Finish coatings to AAMA 2603, AAMA 2604, AAMA 2606.1, AAMA 607.1, AAMA 608.1.
 - .1 Colour: Selected by Owner.
 - .2 Paints and coatings: VOC limit 100 g/L maximum to GS-11 SCAQMD Rule 1113.

3 EXECUTION

3.1 Examination

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for handrail 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 Assemble and install modular guardrail system in accordance with manufacturer's instructions, accepted shop drawings and as necessary to provide continuity of protection.
- .2 Install components plumb and level, in proper alignment with adjacent assemblies.
- .3 At non-penetrating or freestanding guardrail set posts into weighted base plates and secure.

Modular Workplace Guardrail System

- .4 At mechanically anchored guardrails, secure to structure with anchors, plates, angles and fasteners to suit installation condition.
- .5 Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- .6 Assemble with fittings, spigots, sleeves and set-screws to produce secure, vibration-resistant installation.

3.3 Cleaning

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .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.
- .3 Waste Management: separate waste materials for [disposal][and][recycling] in accordance with Section 01 74 19 - Waste Management and Disposal.

3.4 Protection

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by hand rail installation.

END OF SECTION

Rough Carpentry

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 The work of this section includes, but is not necessarily limited to, the following:
 - .1 Plywood backing panels.
 - .2 Wood roof blocking.
 - .3 Exterior sheathing board.
 - .4 Wood ramp framing.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Shop drawings:
 - .1 Submit engineered shop drawings for wood ramp framing.
 - .2 Clearly indicate details of construction, profiles, jointing, fastening and other related details, seismic design, connections, and restraint of wall assemblies.

1.3 Delivery, Storage, and Handling

- .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.

PART 2 - PRODUCTS

2.1 Wood Materials

- .1 General requirements:
 - .1 Except as indicated or specified otherwise lumber shall be softwood, S4S, moisture content not greater than 19% at time of installation, in accordance with following standards:
 - .1 CSA O141-05.
 - .2 NLGA-2014 Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips, grounds:
 - .1 Use S2S material.
 - .2 Dimension lumber sizes: in compliance with Section 12 of the NLGA-2014.
 - .3 Dimension lumber species and grades:
 - .1 Spruce-Pine-Fir.
 - .2 Light framing in accordance with NLGA-2014 Construction grade, S-Dry.

Rough Carpentry

- .3 Planks in accordance with NLGA-2014 No. 2 grade, S-Dry.
- .4 Boards in accordance with NLGA-2014 No. 4 Common grade, S-Dry.
- .3 Curbs, nailers, plywood for roofing: Spruce species, NLGA construction grade, sound and free of imperfections or deficiencies making unsuitable for use. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.2 Wood Treatment

- .1 Fire retardant pressure treatment:
 - .1 Wood shall be pressure impregnated with fire-retardant chemicals in accordance with CAN/CSA O80 and have flame-spread rating of not more than 25 in accordance with CAN/ULC-S102-10.
 - .2 Interior locations: Fire-retardant-treated wood to meet requirements of NFPA 703. Wood shall be impregnated with chemical by a pressure process tested in accordance with CAN/ULC-S102-10 and have a listed flame spread rating of not more than 25.
- .1 Acceptable Product: Goodfellow 'D-Blaze FRT'.

2.3 Panel Materials

- .1 Softwood plywood (CSP): in accordance with CSA O151-09.
- .2 Douglas Fir plywood (DFP): in accordance with CSA O121-08.

2.4 Sheathing Materials

- .1 Exterior sheathing board:
 - .1 Exterior grade plywood, 12.7 mm (1/2") thickness unless otherwise indicated, tongue and groove.

2.5 Fastenings and Hardware

- .1 General:
 - .1 *Provide* fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. *Provide* nails or screws, in sufficient length, to penetrate not less than 38 mm (1-1/2") into wood substrate.
 - .2 Anchors to concrete and unit masonry: Capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E488/E488M-22, conducted by a qualified independent inspection and testing company.
 - .3 Use surface fastenings of following types, except where specific type is indicated.
 - .1 To hollow masonry, plaster and panel surfaces use 9 mm (11/32") expansion bolts or other acceptable anchor.

Rough Carpentry

- .2 To solid masonry and concrete use expansion bolts.
- .3 To structural steel use bolts through drilled hole, or welded stud-bolts or power driven self-drilling screws, or welded stud-bolts.
- .4 To steel deck use bolts through drilled hole or power driven self-drilling screws.
- .4 Fastener materials:
 - .1 Hot-dip galvanized fasteners: in accordance with ASTM A153/A153M-09 Class A or B1 G185 and connectors meeting ASTM A653/A653M-13 Class G-185 sheet or better.
- .5 Hardware materials:
 - .1 Hot-dipped galvanized in accordance with ASTM A153/A153M-09, Class A or B1, and connectors in accordance with ASTM A653/A653M-13, Class G185.
- .2 Sheathing fasteners: Bugle head, corrosion resistant steel, power driven type, minimum length of 3 times thickness of sheathing.

2.6 Accessories

- .1 Wood ramp:
 - .1 Non-slip strips:
 - .1 Acceptable *Product*:
 - .1 Uline '3M 613 Safety-Walk'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.7 Source Quality Control

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

PART 3 - EXECUTION

3.1 General

- .1 Layout work to accommodate work of others. Cut and fit accurately. Erect in position indicated. Align, level, square, plumb, and secure work permanently in place.
- .2 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for bolt head 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.
- .3 Include in work of this section rough hardware such as nails, bolts, nuts, washers, screws, clips, and connectors required for complete and proper installations; and operating hardware required on work of this section for temporary use.
- .4 Do not attach work by wood plugs or blocking in concrete or masonry.
- .5 Do not regard nailers, blocking, and such other fastening provision indicated as exact or complete. Install required provisions for fastening, located and secured to suit *Place of the Work* conditions, and adequate for intended support.

Rough Carpentry

- .6 Verify that grounds required for fastening of components and equipment are located correctly, and sized for adequate support.
- .7 Do not rip or mill fire retardant treated lumber. Only end cuts, drilling holes, and joining cuts are permitted.

3.2 Curbs, Supports, and Blocking at Roofing Assemblies

- .1 Install curbs, upstands, supports and blocking and securely attach to structure, trimmed and levelled to receive flashings and applied roofing materials.
- .2 Slope solid wood caps at parapets to provide positive moisture drainage toward roofing membrane unless otherwise indicated.
- .3 *Provide* wood nailers of minimum 38 mm (1-1/2") thick solid wood members for anchorage of fasteners.
- .4 Securely attach wood members to substrate by anchoring and fastening as indicated, complying with the following:
 - .1 Attach each item in the build-up with fasteners or anchors at spacing not exceeding the following:
 - .1 Wood to wood:
 - .1 Screws: 450 mm (18").
 - .2 Nails: 300 mm (12").
 - .2 Wood to metal:
 - .1 Screws: 450 mm (18").
 - .2 Bolts/washers: 1220 mm (48").
 - .3 Wood to concrete/concrete block:
 - .1 Tapcon type screws: 450 mm (18").
 - .2 Expansion/toggle bolts/washers: 1220 mm (48").
 - .2 Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces.
 - .3 Size fasteners for embedment into substrate in accordance with manufacturer's installation requirements.
- .5 Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood.

3.3 Equipment Backboard

- .1 Refer to Divisions 21, 22, and 23 and Divisions 26, 27, and 28 for requirements for electrical backboards.

END OF SECTION

Architectural Woodwork

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Work of this section includes architectural woodwork as set-out in the drawings including, but not limited to, the following:
 - .1 Cabinetry and hardware.
 - .2 Plastic laminate fabrications.
 - .3 Solid surfacing fabrications.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate with other work for satisfactory and expeditious completion of the work of this section. Coordinate with partition accessories, electrical, communications, audio-visual, and finish components to ensure that proper provisions are made for the installation of the work of this section and for work by others.
 - .2 Where woodwork is to be fitted to other construction, check actual dimension of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delays in the *Work*.
 - .3 *Provide* forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the work of this section and set in place. Instruct applicable *Subcontractors* as to their locations.
 - .4 *Provide* cut-outs for raceways, sleeves, grommets and other manufactured accessories which are required for the work of this section and for work by others.
 - .5 Architectural woodwork specified under this section includes woodwork items which are closely integrated with both prefinished and field painted architectural metalwork, stonework, glass, and built-in electrical components, and consequently requires close coordination with such allied trades. This section is responsible for ensuring correct installation procedures and results.
- .2 Conduct a pre-fabrication meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:

Architectural Woodwork

- .1 Submit manufacturer's *Product* data for each type of *Product* and process proposed for use in the work of this section and incorporated into items of architectural woodwork.
- .3 Shop drawings:
 - .1 Submit shop drawings for the work of this section complying with the North American Architectural Woodwork Standards 4.0 requirements.
 - .2 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .3 Indicate quality standards and grades.
 - .4 Include full scale drawings of exposed-to-view edge conditions.
 - .5 Include plans, sections and large scale details, and indicate components and methods of assembly, fastenings, , and other fabrication information required for the work of this section. Indicate assembly joint lines.
 - .6 Include materials and their characteristics and finishes as applicable including the following:
 - .1 Panel core and material types, thicknesses, compliance with specified standards, special treatments.
 - .2 Adhesive types to be used and locations.
 - .3 Finishing requirements including North American Architectural Woodwork Standards 4.0 finish system number, sheen, and required application steps.
 - .7 Submit coordination drawings indicating locations of concealed grounds, cut-outs, plates, and other required fabrications.
 - .8 Show relation to adjoining construction, details of outside and inside corners and door openings.
 - .9 Provide flame spread ratings of walls and ceiling finishes to meet building code requirements, tested and listed by accredited listing agency.
- .4 Selection samples:
 - .1 Casework door pull hardware and finish.
- .5 Verification samples:
 - .1 Submit samples for purpose of verification of compliance with specified requirements.
 - .2 Submit 3 sets of 200 mm x 200 mm (8" x 8") samples, or 200 mm (8") long as applicable, of each specified *Product*, material and finish, including but not limited to the following:

Architectural Woodwork

- .1 Shop finished materials, showing each type of finish and colour.
- .2 Samples of each specified *Product*, in each specified colour and finish.
- .3 Solid surfacing in each specified colour and finish.
- .4 Plastic laminates, in each specified colour and finish.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit maintenance and cleaning instructions for finishes requiring specific care, noting particularly those procedures or materials which will cause damage to finished surfaces to be included in maintenance manuals.
- .3 Maintenance materials:
 - .1 Deliver extra sets of hardware items for maintenance as follows:
 - .1 2 sets of each type actually installed.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers:
 - .1 Architectural woodwork shall be manufactured by a firm having 5 years' experience, minimum, on work of similar size and quality.
 - .2 Shall be a member in good standing of the Architectural Woodwork Institute or the Architectural Woodwork Manufacturers Association of Canada or the Woodwork Institute.
 - .3 Solid surfacing fabricator: Fabrication to be performed by a solid surface manufacturer's certified fabricator. Submit certification letter prepared by the solid surfacing manufacturer.
 - .2 Installers:
 - .1 Has successfully completed 2 architectural woodwork projects similar in scope, materials and design to this *Project* within the last 5 years.
- .2 Quality standard:
 - .1 Work shall be in accordance with the North American Architectural Woodwork Standards 4.0, Custom Grade.
- .3 Mock-ups:
 - .1 Edge and joint types.

Architectural Woodwork

- .2 Solid surface countertop; 1 complete countertop mock-up.
 - .1 *Provide* test mock-ups for each size of solid surface trough sinks for test of water flow characteristics. Mock-ups shall be complete with specified faucets hooked-up to water supply.

1.6 Delivery, Storage, and Handling

- .1 Protect architectural woodwork during transit, delivery, storage and handling to prevent damage, spoilage, and deterioration.
- .2 Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate architectural woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified under paragraph 1.7 Field Conditions.
- .3 The architectural woodwork manufacturer and the *Contractor* shall be jointly responsible to make certain that architectural woodwork is not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.

1.7 Field Conditions

- .1 Environmental conditions:
 - .1 During storage and installation: Obtain and comply with North American Architectural Woodwork Standards 4.0 for optimum temperature and relative humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained. Woodwork shall be acclimatized for a minimum of 72 hours prior to commencing woodwork installation.
 - .2 During finishing: Comply with Architectural Woodwork Standard's temperature and humidity requirements before, during, and after application of finishes.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Casework integrity shall meet the minimum acceptance levels in accordance with SEFA 8-1999 as outlined in the North American Architectural Woodwork Standards 4.0 and additional or greater loading capacities as specified throughout the North American Architectural Woodwork Standards 4.0.
- .2 Maximum allowable adjustable shelf lengths shall comply with shelves assembly rules per the North American Architectural Woodwork Standards 4.0 based on shelf thickness indicated or scheduled.

Architectural Woodwork

2.2 Wood Materials

- .1 Lumber:
 - .1 Hardwood for concealed blocking and framing: Custom grade, any species that, when painted, will not show any defects.
 - .2 Moisture content: *Provide* kiln-dried (KD) lumber with moisture content range between 6% to 12% for interior architectural woodwork. Maintain temperature and relative humidity during fabrication, storage and finishing operations so that moisture content values for woodwork at time of installation do not exceed 5% to 10%.

2.3 Panel Materials

- .1 Panel material schedule; except where indicated otherwise:
 - .1 Thickness: 16mm (5/8") minimum.
 - .2 Core panels:
 - .1 At plastic laminate: MDF.
 - .2 Plywood backing; countertops, backsplashes, and where indicated: Exterior grade plywood with no added urea-formaldehyde used in composition.
 - .3 Maximum moisture content at time of installation: 10% to 12%.
- .2 Plywood:
 - .1 Veneer core plywood non telegraphing grain: Sanded good one side or good two sides (when both sides exposed or to receive applied finish materials) plywood:
 - .1 Hardwood plywood: in accordance with ANSI/HPVA HP-1-2016.
 - .2 Softwood plywood: to US Plywood Standard APA PS-1-09 Structural Plywood (with Typical APA Trademarks).
- .3 Medium density fibreboard (MDF):
 - .1 To ANSI A208.2-2016, 16mm (5/8") minimum thickness, 720 kg/m³ (45 lbs/ft³) minimum density and as follows:
 - .1 Grade: Grade 130.
 - .2 Formaldehyde emission: F21 for panel thicknesses greater than 8 mm (5/16") and F13 for panels equal to or thinner than 8 mm (5/16"). No added urea-formaldehyde used in composition.

2.4 Plastic and Composite Materials

- .1 High pressure decorative laminate:

Architectural Woodwork

- .1 General purpose grade: in accordance with ANSI/NEMA LD 3-2005, Horizontal General Purpose Grade (HGS).
- .2 PLAM-1:
 - .1 Acceptable *Product*: Pionite.
 - .2 Colour: White Elm WE261.
 - .3 Finish Textured/Suede.
- .3 PLAM-2:
 - .1 Acceptable *Product*: Formica HPL.
 - .2 Colour: Milk 9634-58.
 - .3 Finish: Matte.
- .4 Subject to compliance with requirements, provide products by one of the following acceptable alternates:
 - .1 Formica.
 - .2 Laminart.
 - .3 Nevamar.
 - .4 Pionite.
 - .5 Wilsonart.
- .2 SS; Solid surfacing sheet:
 - .1 Homogenous (not coated, laminated or composite construction), filled material containing methyl methacrylate.
 - .1 Acceptable *Product*: Dupont 'Corian'.
 - .2 Nominal sheet thickness: 13 mm (1/2") minimum, unless otherwise indicated.
 - .3 Colour/pattern:
 - .1 SS1: London Sky.
 - .2 SS2: Venaro White.
 - .3 SS3: Glacier White.
 - .4 Substitutions: in accordance with Section 01 25 00.
 - .2 Integral under mount sink:
 - .1 Acceptable *Product*:
 - .1 Dupont 'Corian Model 810P'.
 - .2 Colour/pattern: Glacier White.

Architectural Woodwork

2.5 Metal Base

- .1 Stainless steel base, No. 4 finish: in accordance with Section 05 10 00.

2.6 Fasteners and Adhesives

- .1 Fasteners shall comply with North American Architectural Woodwork Standards 4.0.
- .2 Adhesives: Shall be used for intended purpose and manufacturer materials applications and installation, applied in accordance with manufacturer's written requirements and shall comply with the "adhesive usage guidelines" recommendations of North American Architectural Woodwork Standards 4.0.

2.7 Hardware

- .1 Casework hardware; to be furnished and installed by the architectural woodwork manufacturer.
 - .1 Where casework hardware is not specified or indicated on drawings or scheduled, casework hardware shall comply with ANSI/BHMA Standards, latest edition, minimum grades, loading and other basic rules per the North American Architectural Woodwork Standards 4.0.
 - .2 Drawer slide; medium duty:
 - .1 Soft close.
 - .2 Pound Class 100.
 - .3 Height: 45 mm (1-47/64").
 - .4 Clearance: 13 mm (1/2") plus 0.8 mm (1/32") minus 0 inches per side.
 - .5 *Acceptable Products:*
 - .1 BLUM Movento.
 - .2 Salice 'Futura'.
 - .3 Hinges:
 - .1 *Acceptable Product:*
 - .1 Marathon 'DTC C-80 Soft-Close Hinge, 105-C80A675NF'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .4 Pulls; doors and drawers, except where otherwise indicated:
 - .1 *Acceptable Product:*
 - .1 Marathon 'Modern Bar Pull, 128 mm, Brushed Satin Nickel, 9303-BSN'.
 - .2 Substitutions: in accordance with Section 01 25 00.

Architectural Woodwork

- .5 Locks; swinging doors and drawers, except where otherwise indicated:
 - .1 Locks shall be keyed alike, unless otherwise indicated.
 - .2 *Acceptable Product:*
 - .1 Hafele 'Cam locks, FH Series'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .6 Magnetic catches:
 - .1 *Acceptable Product:*
 - .1 Hafele 'Magnetic Catch 3-4 KG Pull.'
 - .1 Colour/finish: to be later selected by Consultant.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .7 Grommets:
 - .1 *Acceptable Product:*
 - .1 Richelieu 'Round Cable Grommet, 9004430'.
 - .1 Colour: White.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .8 Exposed shelf supports.
 - .1 *Acceptable Product:*
 - .1 Richelieu 'U-Shaped Steel Pilaster, 2553024'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Colour shall be White.
- .9 Pilaster strips:
 - .1 Flush mounted.
 - .2 *Acceptable Product:*
 - .1 Knappe & Vogt 255 Series.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .10 Pilaster clips:
 - .1 *Acceptable Product:*
 - .1 Knappe & Vogt 256 Series.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .11 Adjustable shelf standards and supports:

Architectural Woodwork

- .1 Finishes:
 - .1 For cabinets with baked enamel finish: Cadmium or chrome plated steel.
 - .2 For stainless steel cabinets: stainless steel or gloss nickel finish.
- .2 Acceptable *Product*:
 - .1 Richelieu 'Model 1461210'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .12 Nuts, bolts, and washers: shall be stainless steel or aluminum.
- .13 Concealed work surface support brackets:
 - .1 Finish: manufacturer standard shop paint finish, and to receive site applied PT-1 White paint finish in accordance with Section 09 91 00.
 - .2 Provide required support backing to support 457 mm x 2400 mm (18" x 94") work surface at Corridor 1839, outside Reception 1823.
 - .3 Acceptable *Product*:
 - .1 Richelieu '6240120290'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.8 Finishes - Interior Architectural Woodwork

- .1 General: The entire finish of interior architectural woodwork is specified in this section, regardless of whether factory applied or applied after installation.
- .2 Preparations for finishing:
 - .1 Prior to finishing, exposed portions of woodwork shall have handling marks or effects of exposure to moisture removed with a thorough final sanding over surfaces of the exposed portions, using appropriate grit sandpaper, and shall be cleaned prior to applying sealer or finish. Sanding shall be completed just prior to stain or finishing application.
 - .2 Concealed surfaces of woodwork that might be exposed to moisture, such as those adjacent to exterior concrete or masonry walls, shall be back-primed.
 - .3 Comply with referenced quality standard in Part 1 for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

2.9 Fabrication

- .1 Fabricate woodwork to dimensions, profiles, and details indicated with openings and mortises pre-cut, where possible, to receive hardware and other items of work.

Architectural Woodwork

- .2 Complete fabrication, assembly, finishing, hardware application, and other work before shipment to maximum extent possible. Trial fit in shop and disassemble components only as necessary for shipment and installation. Where necessary, provide ample allowance for scribing, trimming, and fitting. Reassemble with concealed fasteners.
- .3 *Provide* woodwork, solid tops and other indicated materials with pre-cut openings, where possible, for hardware, appliances, plumbing fixtures, electrical work, telephone cut-outs and similar items. Locate openings accurately and *Provide* proper size and shape. Smooth edges of cut-outs and, where located in countertops, seal edges of cut-outs with a water-resistant coating.
- .4 *Provide* framing for architectural woodwork, complete with bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.
- .5 Reinforcing shown is minimum. *Provide* additional reinforcing as required to ensure a rigid assembly. Take responsibility for the stability of furniture and fitments.
- .6 *Provide* balancing sheets as required, and specified, complying with the North American Architectural Woodwork Standards 4.0.
- .7 *Provide* surface mount blocking and strapping necessary to support the work of this section. Such blocking shall not be exposed upon completion of work.
- .8 Prefinish work at the factory, except where specified or indicated otherwise.

2.10 Fabrication - Solid Surfacing

- .1 Fabricate components in shop to greatest extent practical to size and shape indicated, in accordance with reviewed shop drawings and manufacturer's written requirements.
- .2 Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 100 mm (4") wide solid surfacing material reinforcing strip under joints.
- .3 *Provide* holes and cut-outs as indicated or as required.
- .4 Rout and finish component edges to a smooth, uniform finish. Rout cut-outs then sand edges smooth. Repair or reject defective or inaccurate work.
- .5 Surfaces shall have a uniform finish.

PART 3 - EXECUTION

3.1 Preparation

- .1 Condition woodwork to field conditions in installation areas before installing. Ensure that field conditions have been provided as requested and specified.
- .2 Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

Architectural Woodwork

- .3 *Provide grounds, nailers and other required fabrications which are to be built into other work when required.*
- .4 Ensure that wall and ceiling variations are not in excess of 6.4 mm (1/4") in 3658 mm (144") and that floors are not in excess of 12.7 mm (1/2") in 3658 mm (144") of being plumb, level, flat, straight, square, of the correct size. Variations shall be corrected prior to installation of work of this section.
- .5 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

3.2 Installation

- .1 Install woodwork to comply with North American Architectural Woodwork Standards 4.0 for same grade specified in Part 1 of this section for type of woodwork involved.
- .2 Install woodwork plumb, level, true, and straight with no distortions.
- .3 Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- .4 Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
- .5 Complete the finishing work specified in this section to whatever extent not completed at shop or before installation of woodwork.

3.3 Installation - Tolerances

- .1 Install to a tolerance of 3 mm in 2400 mm (1/8" in 8'-0") for plumb and level (including tops) and with no variations in flushness of adjoining surfaces unless otherwise acceptable in accordance with the North American Architectural Woodwork Standards 4.0.

3.4 Adjusting and Cleaning

- .1 Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork.
- .2 Clean, lubricate, and adjust hardware.
- .3 Clean woodwork on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.5 Protection

- .1 Protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

Architectural Woodwork

- .2 *Provide* final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that woodwork is without damage or deterioration at time of *Substantial Performance of the Work*.

END OF SECTION

Self-Adhering Sheet Waterproofing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Sheet waterproof membrane at vertical locations as indicated.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit drawings showing locations of joints, section of entire system, section of each sleeve and penetration condition, flashing conditions and other fabrication information in accordance with Section 01 33 00.
- .4 Samples:
 - .1 Submit samples complete with manufacturer's labels intact, of materials to be used for the work of this section prior to commencement of work, allowing ample time for review and acceptance by *Consultant* and independent inspection and testing company. Do not proceed with work of this section until samples are accepted.
- .5 Manufacturers' instructions:
 - .1 Submit *Product* manufacturer's standard and project specific installation details required to cover the full spectrum of waterproofing conditions applicable to the work of this section.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*.
 - .1 Has adequate plant, equipment and skilled workers to perform the work expeditiously.
 - .2 Has successfully completed installations similar to that specified during a period of at least the immediate past 5 years.
 - .3 Has been approved in writing by the self-adhered waterproofing system manufacturer for the installation of specified *Product*.
- .2 Mock-up:

Self-Adhering Sheet Waterproofing

- .1 Construct panels 3 m² (32 ft²) of typical waterproofing installation for review and approval of *Consultant* Locate at the *Place of the Work* as part of final installation.
- .2 Do not proceed until mock-up has been reviewed and accepted by *Consultant*.

1.5 Field Conditions

- .1 Apply only when air and surface temperatures are maintained above 4°C, have been so for 48 hours, and are not likely to fall lower until the work of this section is completed, unless otherwise approved.
- .2 The work of this section may proceed at temperatures below 4°C only with mutual documented agreement of independent inspection and testing company, manufacturer and applicator that, with materials and methods used, specified installation will be achieved.
- .3 Ensure application temperature and humidity recommended by material manufacturer are maintained before, during and after installation.
- .4 Provide forced air circulation or adequate natural ventilation during installation and curing periods for enclosed application.
- .5 Do not expose materials vulnerable to water or sun damage in quantities greater than can be installed the same day.
- .6 Install waterproofing on dry surfaces, free of snow and ice and during weather that will not introduce moisture into waterproofing system.

1.6 Delivery, Storage, and Handling

- .1 Package materials and identify on attached labels the manufacturer, contents and material specification number.
- .2 Store solvent-base liquids and surface conditioner away from excessive heat and open flame. Store surface conditioner at temperature above 5°C.
- .3 Pallets of waterproofing membrane shall not be double stacked.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Waterproofing system shall provide watertight protection to prevent the passage of water under hydrostatic pressure.

2.2 Materials

- .1 Waterproofing membrane system; self-adhering polymeric waterproofing membrane:
 - .1 Thickness: 1.5 mm (1/16").
 - .2 Tensile strength: in accordance with ASTM D412-16(2021).
 - .1 Membrane: 2.24 MPa (325 psi) minimum.
 - .3 Elongation: in accordance with ASTM D412-16(2021).

Self-Adhering Sheet Waterproofing

- .1 Polymeric membrane: 300 percent minimum.
- .4 Water vapour transmission: in accordance with ASTM E96/E96M-13, Method B: 0.05 grains/ft²/hour maximum.
- .5 Water absorption: in accordance with ASTM D570-98(2010)e1, 0.1%, 72 hours maximum.
- .6 Resistance to hydrostatic head: equivalent to 70 m (230 ft) of water minimum.
- .7 Puncture resistance: in accordance with ASTM E154/E154M-08a(2019), 222 N (50 pounds) minimum.
- .8 Acceptable *Products*:
 - .1 Henry 'Blueskin WP 200'.
 - .2 Colloid Environmental Technologies Company (CETCO) 'Envirosheet', as distributed by DRE Industries Inc.
 - .3 GCP Applied Technologies 'Bituthene 3000' and 'Bituthene Low Temperature'.
 - .4 IKO 'AquaBarrier FP'.
 - .5 Soprema 'Colphene 3000'.
 - .6 W.R. Meadows 'Mel-Rol'.
- .2 Primer/surface conditioner: In accordance with membrane manufacturer's written installation requirements.
- .3 Bonding asphalt: Single component bonding asphalt. Use manufacturer's proprietary mastic.
- .4 Protection board:
 - .1 Hollow core plastic type; vertical applications: ultra-violet resistant corrugated polypropylene copolymer flexible twin wall sheet, 2 mm (0.079") thick.
- .5 Mastic; self-adhered membrane systems: Single component, utility grade, rubber based sealant. Use manufacturer's proprietary mastic.
- .6 Protection board adhesive: as recommended by waterproofing membrane system and protection board manufacturers.

PART 3- EXECUTION

3.1 General

- .1 Comply with manufacturer's *Product* data, including *Product* application and installation requirements, as well as manufacturer's shipping and storage recommendations.
- .2 Examine conditions of substrates and other conditions under which the work of this section is to be performed and notify the *Consultant*, in writing, of circumstances detrimental to the proper completion of the *Work*. Do not proceed with the work of this section until unsatisfactory conditions are corrected and are acceptable for compliance with manufacturer's written recommendations.

Self-Adhering Sheet Waterproofing

3.2 Preparation - Typical

- .1 Protect adjacent work areas and finish surfaces from damage or contamination from waterproofing *Products* during installation operations.
- .2 Soil substrates: Grade substrates shall consist of well-levelled soils without voids and debris, and compacted in accordance with Section 31 23 00 for uniform support and containment of waterproofing sheets.
- .3 Concrete surfaces shall be smooth, clean, dry and free of any foreign matter that would otherwise hinder either adhesion or regularity of waterproofing membrane installation.
- .4 Remove fins, ridges, and other protrusions levelled and smoothly finished to match monolithic concrete surface. Completely fill honeycomb, aggregate pockets, holes and other voids with non-shrink cementitious grout levelled and smoothly finished to match monolithic concrete surface.
- .5 Priming: in accordance with manufacturers written requirements.

3.3 Vertical Membrane Installation

- .1 Apply waterproofing membrane system in accordance with manufacturer's written requirements.
- .2 Inspect membrane thoroughly before placement of protection course and make any corrections or repairs as necessary. Patch tears and any inadequately lapped seams using the waterproofing membrane.

3.4 Protection Course

- .1 Protect waterproofing membrane installation to avoid damage from other trades and backfilling operations.
- .2 Adhere each board using waterproofing protection board adhesive. Apply an adequate number spots of adhesive for each board to ensure resistance to wind uplift and movement due to construction traffic in accordance with manufactures written requirements.
- .3 Press each board into intimate contact with the waterproofing membrane and slide into position tightly against the previous. Gaps shall be no larger than 6 mm (1/4").

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Field tests and inspections:
 - .1 Upon completion of the work of this section, have entire installation inspected by membrane manufacturer's authorized representative in the presence of *Consultant*.
- .3 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

Thermal Insulation

PART 1 - GENERAL

1.1 Summary

.1 Section includes:

- .1 Semi-rigid insulation board; rainscreen cavity assemblies; INSUL-1.
- .2 Rigid insulation board; below grade insulation; INSUL-2.
- .3 High load rigid insulation board, 690 kPa (100 psi) compressive strength; INSUL-3.
- .4 Semi-rigid insulation board; white vinyl faced; INSUL-4.
- .5 Foamed-in-place (gap filler) filler insulation; INSUL-5.

.2 Section excludes:

- .1 Rigid roof insulation; INSUL-6: in accordance with Section 07 52 16.
- .2 Semi-rigid insulation at curtain wall; INSUL-7: in accordance with Section 08 44 00.
- .3 Acoustic batt insulation; INSUL-8: in accordance with Section 09 29 00.

1.2 Submittals

.1 Submit required submittals in accordance with Section 01 33 00.

.2 *Product* data:

- .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .2 Submit data and installation instructions for materials and prefabricated devices, providing descriptions sufficient for identification at the *Place of the Work*.
- .3 Submit data from manufacturer's or independent laboratory indicating compatibility and adhesive results of proposed materials.

1.3 Quality Assurance

.1 Qualifications:

.1 *Subcontractor*:

- .1 Has adequate plant, equipment and skilled workers to perform the work expeditiously.
- .2 Has successfully completed installations similar to that specified during a period of at least the immediate past 5 years.

PART 2 - PRODUCTS

2.1 Insulation Materials

- .1 INSUL-1; Semi-rigid insulation board; rainscreen cavity assemblies:

Thermal Insulation

- .1 Mineral-fibre in accordance with CAN/ULC S702-14, Type 1, either dual density or mono density.
 - .1 Dual density:
 - .1 Outer layer: 100 kg/m³ (6.2 lb/ft³) in accordance with ASTM C303-21.
 - .2 Inner layer: 61 kg/m³ (3.8 lb/ft³) in accordance with ASTM C303-21.
 - .2 Mono density:
 - .1 96 kg/m³ (6.0 lb/ft³) in accordance with ASTM C612-14.
- .2 Acceptable *Products*:
 - .1 Johns Manville 'Cladstone Water & Fire Block Insulation – 6.0 PCF'.
 - .2 Owens Corning 'Thermafiber RainBarrier HD'.
 - .3 Rockwool 'CavityRock'.
- .2 INSUL-2; Rigid insulation board; below grade insulation:
 - .1 Extruded polystyrene, closed-cell, smooth skin, in accordance with CAN/ULC S701.1-17, Type 4, 207 kPa (30 psi) compressive strength.
 - .2 Acceptable *Products*:
 - .1 DuPont 'Styrofoam SM'.
 - .2 Owens Corning 'Foamular C-300'.
 - .3 Soprema 'SOPRA-XPS 30'.
- .3 INSUL-3; High load rigid insulation board:
 - .1 Extruded polystyrene, closed-cell, smooth skin, in accordance with CAN/ULC S701.1-17, Type 4:
 - .2 Compressive Strength, ASTM D1621-16, 690 kPa (100 psi) minimum (measured at 5% deformation or at yield, whichever occurs first).
 - .3 Acceptable *Products*:
 - .1 DuPont 'Styrofoam Highload 100'.
 - .2 Owens Corning 'Foamular 1000'.
 - .3 Soprema 'SOPRA-XPS 100'.
- .4 INSUL-4; Semi-rigid insulation board; white vinyl faced:
 - .1 Semi-rigid mineral fibre insulation in accordance with ASTM C612-14, 64 kg/m³ (4 lb/ft³) minimum density in accordance with ASTM C612-14 for basalt rock and steel slag mineral fibre insulation, and 67 kg/m³ (4.2 lb/ft³) minimum density in accordance with ASTM C612-14 for glass fibre mineral-fibre insulation, with reinforced vinyl with white film face, flame spread rating of less than 25 per CAN/ULC-S102-10, adhered with flame retardant adhesive to one face of insulation.
 - .1 Acceptable *Products*:

Thermal Insulation

- .1 Rockwool 'RockBoard 40'.
- .2 Owens Corning 'Fiberglas Type 703'.
- .2 Reinforced vinyl white film face:
 - .1 Acceptable *Products*:
 - .1 Alpha Engineered Composites 'VR-R-Plus'.
 - .2 Lamtec Corporation 'WMP-VR-R Plus'.
 - .2 Provide perforated face film where required or indicated.
- .3 Joint tape:
 - .1 Self adhering white vinyl tape, minimum 0.45 mm (0.175") thick.
 - .1 Acceptable *Products*:
 - .1 3M 'VentureClad 1579GCW-WM'.
 - .2 No substitutions or alternatives will be accepted.
- .5 INSUL-5; Flexible low expansion polyurethane foam; for thermal insulation around exterior framing assemblies (gap filler):
 - .1 Single-component, high performance, gun-grade polyurethane flexible foam that performs as a thermal barrier. With an industry leading movement range of +/-15% (Movement Accommodation Factor of 30%).
 - .2 Acceptable *Products*:
 - .1 Geocel 'Airblock'.
 - .2 Tremco ExoAir Flex Foam.

2.2 Accessories

- .1 Insulation fasteners: HDPE washer, zinc plated pin finish, pins purpose made to suit substrate material, 50 mm (2") minimum insulation holding diameter; direct fasten type, pin depth length to suit insulation thickness.
 - .1 For insulation equal or less than 150 mm (6") thick:
 - .1 Acceptable *Products*:
 - .1 ITW Construction Products Ramset 'InsulFast'.
 - .2 For insulation greater than 150 mm (6") and equal or less than 200 mm (8") thick:
 - .1 Acceptable *Products*:
 - .1 Hilti 'X-IE'.
- .2 Adhesive for rigid insulation boards: Polymer modified liquid applied membrane, compatible with insulation to be applied, type as manufactured for the attachment of insulation.

Thermal Insulation

PART 3 - EXECUTION

3.1 Installation - General

- .1 Install insulation in accordance with manufacturer's written requirements applicable to products and applications indicated.
- .2 Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- .3 Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- .4 Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness. Where multiple layers of insulation boards/batts are required, offset outer layer insulation board/batt joints 150 mm (6") from underlying insulation layer(s).
- .5 Install attachment at rate as required to prevent displacement of insulation boards during construction operations.
- .6 Butt joints tightly and offset vertical joints to form an unbroken thermal envelope. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .7 Apply insulation to ensure total and complete coverage of surfaces indicated to be insulated, and in direct contact with such surfaces.
- .8 Ensure integrity and continuity of insulation at juncture with different types of materials and seal in an acceptable manner.
- .9 Do not cover insulation until it has been reviewed and accepted by *Consultant*.

3.2 Installation - Semi-Rigid Insulation

- .1 Install at masonry assembly locations in accordance with Section 04 05 00.
 - .1 Where applicable, fasten insulation using masonry tie securement plates *Provided* under Section 04 05 19.
 - .2 In locations where insulation clips are not practical or available with masonry connectors, mechanically fastened to substrate with minimum of 5 insulation fasteners per insulation board and maximum spacing of 610 mm (24") on centre.
 - .3 Position fasteners 75 mm (3") from insulation board edges.
- .2 For other cladding assemblies:
 - .1 Mechanically fasten to substrate with minimum of 5 insulation fasteners (dice pattern) per insulation board and maximum spacing of 610 mm (24") on centre.
 - .2 Position fasteners 75 mm (3") from insulation board edges.
- .3 For vinyl faced semi-rigid insulation:
 - .1 Arrange insulation boards in uniform layout, using full size insulation boards.

Thermal Insulation

- .2 Apply insulation boards with board joints staggered and offset between insulation layers; mechanically fastened to substrate with minimum of 5 insulation fasteners per insulation board and maximum spacing of 610 mm (24") on centre.
- .3 Apply tape to facing joints, centred at insulation joints. Surfaces must be smooth, clean dry and free from loose contaminants.

3.3 Installation - Below-Grade Rigid Insulation

- .1 On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written requirements.
- .2 On horizontal surfaces, loosely lay insulation units according to manufacturer's written requirements. Stagger end joints and tightly abut insulation units.

3.4 Installation - Foamed-in-Place (Gap Filler) Insulation

- .1 Install one-component foam insulation to fill gaps where indicated, in accordance with CAN/ULC S710.2-11 application standard.

3.5 Protection

- .1 Comply with manufacturer's written requirements respecting protection.
- .2 Protect polystyrene insulation from extended exposure to sunlight.
- .3 Repair damage resulting from performance of work of this section in manner acceptable to *Consultant*.

END OF SECTION

Sprayed-Applied Foamed-in-Place Insulation

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Sprayed foam insulation.
 - .2 Sprayed protective thermal barrier.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate the work of this section with sections referencing this section.
 - .2 Coordinate with related work to allow for installation of required materials prior to spray insulation.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Samples:
 - .1 Submit samples of all materials proposed for use in the work of this section.
 - .2 Submit duplicate 305 mm x 350 mm (12" x 12") samples of sheet membrane material.
- .4 Applicator's certificate:
 - .1 Sprayed polyurethane foam (SPF) installer certificate: Submit name of SPF installer with copy of certification card verifying that the SPF installer is licensed by the source manufacturer.
 - .2 Submit sprayed foam applicator's certificate (produced by CUFCA or manufacturer) 2 weeks prior to commencing the work of this section.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Applicators certificates and training:
 - .1 Application of insulation/air barrier system only by applicators certified by CUFCA/NECA (Canadian Urethane Foam Contractors Association/National Energy Conservation Association) or certified by the manufacturer of the system being installed for the installation of their system and have third party independent certification in accordance with the training requirements outlined in CAN/ULC S705.2-05.

Sprayed-Applied Foamed-in-Place Insulation

- .2 Transition air barrier membrane shall be applied by applicator trained and approved by manufacturer for application of its products.
- .3 Sprayed-applied foamed-in-place air barrier applicators shall have a minimum 5 years proven experience.
- .2 Material manufacturer/distributor shall have an on-site quality assurance program. Submit three copies of quality assurance program upon request.
- .2 Daily work sheets:
 - .1 Complete Daily Work Sheet as required by CAN/ULC S705.2-05. Submit a copy of completed Daily Work Sheets to *Consultant*. Submit copy of completed Daily Work Sheets to *Consultant* if requested.

1.5 On-Site Documentation

- .1 Maintain a copy of the manufacturer's technical manual on site during application of polyurethane foam.
- .2 Compile Daily Work Records chronologically and maintain on site during application.

1.6 Occupancy Requirements

- .1 Occupancy: In accordance with CAN/ULC-S774, occupancy is only permitted following delivery of minimum 0.3 air changes per hour for 24 hours following installation.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Long Term Thermal Resistance LTTR: Tested by an independent laboratory in accordance with CAN/ULC S770-15(R2020) and achieving the required values at a minimum core density of 28.34 kg/m³ (1.77lb/ft³).
- .2 Aged thermal resistance values based on test methods other than LTTR or at densities lower than specified will not be accepted.
- .3 LTTR-values shall be based on density not less than minimum insitu density.
- .4 Core density shall be confirmed by field testing.
- .5 Products of this section shall be:
 - .1 Listed with Canadian Construction Materials Centre (CCMC) certifying product for use as insulation in accordance with the building code.

2.2 Materials

- .1 Sprayed foam insulation:
 - .1 Sprayed polyurethane foam: To CAN/ULC S705.1-15, HFO-based closed cell, spray-applied rigid cellular polyurethane foam, medium density.
 - .2 Sustainable Requirements:
 - .1 Low GWP (Global Warming Potential): Utilizing HFO blowing agent, GWP <1.

Sprayed-Applied Foamed-in-Place Insulation

- .2 Eco-efficiency analysis, life cycle assessment approved by an independent third party.
- .3 Modify spray foam to suit temperature application in accordance with insulation manufacturer's recommendations.
- .4 Burning characteristics; maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame spread: 500.
 - .2 Smoke developed: 500.
- .5 Water vapour permeance; with outer skins to simulate actual in-situ conditions:
 - .1 Maximum 60 ng/Pa.m² .s. (1 perm) when tested to ASTM E96/E96M-13.
- .6 Acceptable *Products*:
 - .1 BASF Building Systems 'Walltite v.5'.
 - .2 Carlisle Spray Foam Insulation 'SealTite One'.
 - .3 Elastochem Specialty Chemicals Inc. 'Insulthane Extreme'.
 - .4 Huntsman Building Solutions 'Heatlok Soya HFO/Polarfoam SOYA HFO'.
 - .5 Soprema 'Sopra SPF 200'.
 - .6 Substitutions: in accordance with Section 01 25 00.
- .2 Sprayed protective thermal barrier and bonding agent:
 - .1 Thermal barrier that, when tested in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials", will not develop an average temperature rise more than 140°C or a maximum temperature rise more than 180°C at any point on its unexposed face within 10 min. .
- .3 Accessories:
 - .1 Concealed sheet metal flashing (cavity firestop where noted):
 - .1 Prefinished sheet steel: Commercial quality to ASTM A653/A653M-13 with Z275 designation zinc coating.
 - .2 Minimum thickness: 0.45 mm (0.0179") (26 gauge).
 - .3 Finish: Factory prefinished with polyester powder coat or enamel finish.
 - .2 Fasteners: Galvanized steel screws with anticorrosive coating system and EPDM washers.

2.3 Compatibility

- .1 Ensure that materials used are compatible. Obtain confirmation from sprayed foam insulation manufacturer.
- .2 Provide written proof of compatibility.

Sprayed-Applied Foamed-in-Place Insulation

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that surfaces and conditions are ready to accept the work of this section. Application of work of this section shall be deemed acceptance of existing work and existing conditions. Report in writing defects in substrate which may adversely affect the performance of the sprayed-applied foamed-in-place insulation.
- .2 Before commencing work, ensure that environmental and site conditions are suitable for installation of materials.
- .3 Commencement of work shall imply acceptance of surfaces and conditions.

3.2 Preparation

- .1 Surfaces to receive sprayed-applied foamed-in-place insulation shall be free of frost, loose or foreign matter which might impair adhesion of materials.
- .2 Prepare surface by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, millscale and other contaminants which will affect adhesion and integrity of the foam insulation/air barrier system. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the foam insulation. Ensure surfaces are dry before proceeding.
- .3 Prepare joints to receive foam air barrier sealant by brushing, scrubbing, wiping, scraping or grinding to remove loose mortar, dust, oil grease, solvents, oxidation, mill scale and other contaminants which will affect adhesion and integrity of foam sealant.
- .4 Do not allow sprayed-applied foamed-in-place insulation to cover or mark adjacent surfaces. Use masking materials if necessary.

3.3 Installation

- .1 Apply materials in accordance with material manufacturer's written requirements.
- .2 Apply sprayed-applied foamed-in-place insulation in accordance with CAN/ULC S705.2-05.
- .3 Overlap joints of transition air barrier membrane a minimum 100 mm (4"). Seal laps and termination joints with edge of transition air barrier membrane sealer. Transition air barrier membrane shall be installed prior to application of the urethane foam. Transition air barrier membrane shall be installed prior to application of the urethane foam.
- .4 Fill joints with sprayed-applied foamed-in-place insulation making allowances for post expansion of foam.
- .5 Finish joints shall be free from air pockets and imbedded foreign materials. Cut back excess foam sealant after cutting flush with surrounding surfaces unless otherwise directed or detailed.
- .6 Apply sprayed-applied foamed-in-place insulation within +6.4 mm (1/4") and -0 mm (0") of indicated thicknesses.

Sprayed-Applied Foamed-in-Place Insulation

- .7 Maximum pass thickness shall be 50 mm (2") per application pass. After spraying a pass, cooling time shall be allowed for the dissipation of heat. Allow a period of at least 10 minutes before applying a second pass. For overall installation thicknesses of greater than 100 mm (4") comply with manufacturer's installation requirements.
- .8 Finished sprayed-applied foamed-in-place insulation shall be free of voids and embedded foreign materials.
- .9 Concealed sheet metal flashing:
 - .1 Install continuous formed sheet metal with fasteners at maximum vertical spacing of 450 mm (18") on centre.

3.4 Installation - Sprayed Protective Thermal Barrier

- .1 Apply bonding adhesive or primer to substrate in accordance with manufacturer's written installation requirements.
- .2 Apply sprayed protective thermal barrier to correspond with tested assemblies, or acceptable calculation procedures to provide following fire resistance ratings for protection of sprayed foam insulation.
- .3 Apply sprayed protective thermal barrier over substrate, building up to required thickness to cover substrate with monolithic blanket of uniform density and texture.

3.5 Adjusting and Cleaning

- .1 Remove over-spray and masking material immediately after foam has cured to hard surface film.
- .2 Clean and make good surfaces soiled or damaged by work of this section. Consult with section of work soiled before cleaning to ensure methods used will not damage their work.
- .3 Do not permit adjacent work to damage work of this section. Damage to work of this section caused by other sections shall be made good by this section at the expense of the section which caused the damage.

3.6 Field Quality Control - General

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

Below-Grade Vapour Barrier

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Below-grade vapour barrier; located beneath concrete slabs on grade.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* to be for used in the work of this section.
- .3 Manufacturer's instructions:
 - .1 Submit manufacturer's *Product* installation instruction for *Products* to be used in the work of this section.
- .4 Vapour barrier test results and certification:
 - .1 Provide certification prepared by accredited testing company for test procedures listed in Table 1 of ASTM E1745-17 and paragraphs 7.1.2, 7.1.3, 7.1.4, and 7.1.5 of ASTM E1745-17. Provide the date of the most recent test and the test results for each test.
 - .1 Accompany certification tests specified above with letter signed by *Product* manufacturer attesting that material to be *Provided* is of the same formulation and manufacture as the *Product* tested.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products*.

PART 2 - PRODUCTS

2.1 Materials

- .1 Vapour barrier membrane:
 - .1 Performance criteria:
 - .1 Permeance, as tested after conditioning: not greater than 0.5700 ng/(Pa*s *m²)(0.010 perms (gm/ft²/in-Hg)) in accordance with ASTM E1745-17 paragraphs 7.1.2 through 7.1.5.
 - .2 Strength: Class A to ASTM E1745-17.
 - .3 Thickness of plastic:
 - .1 Minimum 0.38 mm (15 mils).

Below-Grade Vapour Barrier

- .2 Acceptable *Products*:
 - .1 Stego Industries 'Stego Wrap Vapor Barrier', thickness specified above.
 - .2 W.R. Meadows 'PERMINATOR', thickness specified above.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .2 Vapour barrier membrane joint tape:
 - .1 Pressure sensitive high density polyethylene tape, 100 mm (4") wide, product selection per vapour barrier membrane manufacturer's written installation requirements.
- .3 Penetration flashing:
 - .1 Vapour barrier membrane material and vapour barrier joint tape in accordance with manufacturer's written requirements.

PART 3 - EXECUTION

3.1 Installation

- .1 Install vapour barrier membrane in accordance with below-grade vapour barrier manufacturer's written requirements and ASTM E1643-18a.
- .2 Extend vapour barrier to the perimeter of the slab and seal to perimeter and penetration conditions. Seal around penetrations such as utilities and columns in order to create a monolithic membrane between the surface of the slab and moisture sources below the slab and at the slab perimeter.
- .3 Install vapour barrier membrane using largest practicable sheet size to minimize joints over compacted fill.
- .4 Inspect vapour barrier membrane sheets for continuity. Repair punctures and tears in vapour barrier membrane with sealing tape before work is concealed.
- .5 Vapour barrier membrane installation shall be continuous and vapour tight.
- .6 Overlap vapour barrier membrane joints 150 mm (6") minimum and tape seal with vapour barrier joint tape.
- .7 Unroll vapour barrier membrane with longest dimension parallel with direction of concrete placement.
- .8 Lap vapour barrier membrane up foundation walls a minimum of 100 mm (4") and tape seal with vapour barrier joint tape.
- .9 Centre vapour barrier joint tape over vapour barrier membrane laps and joints. Keep area of tape adhesion free of dust, dirt, and moisture.
- .10 Cut slit around pipes, ductwork, rebar, and wire penetrations to place the initial layer of vapour barrier membrane.
 - .1 Cut a piece of vapour barrier membrane minimum width of 300 mm (12"). The length should be 1 1/2 times the pipe circumference. With a roofer's knife or scissors, cut "fingers" half the width of the film.

Below-Grade Vapour Barrier

- .2 Wrap vapour barrier membrane around and tape the collar onto the pipe and completely tape fingers to the bottom layer of vapour barrier membrane with vapour barrier joint tape.
- .11 In the event that vapour barrier membrane is damaged during or after installation, repair the membrane. Cut a piece of vapour barrier membrane large enough to cover damage by minimum overlap of 150 mm (6"). Clean adhesion areas of dust, dirt, and moisture. Tape down edges using vapour barrier joint tape.

END OF SECTION

Air Barrier Systems

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Sheet-applied self-adhesive vapour impermeable air barrier membrane.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Compatibility statement:
 - .1 Submit manufacturer's compatibility statement validating compatibility of air barrier system materials with substrates and adjacent materials.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

1.5 Delivery, Storage, and Handling

- .1 Package materials and identify on attached labels the manufacturer, contents and material specification number.
- .2 Store flammable solvent-base liquids away from excessive heat and open flame. Primer contains solvent. Do not use near open flame.
- .3 Store surface conditioner at temperature above 5°C to facilitate handling.
- .4 Store roll materials on end.

1.6 Field Conditions

- .1 *Provide* forced air circulation during curing period for enclosed applications.

Air Barrier Systems

- .2 Low temperature application:
 - .1 Perform adhesion test for membrane when ambient temperature is below -5°C.
 - .2 Proceed with work when temperature is (or predicted) to fall below -5°C ambient temperature only with the mutual documented agreement of independent inspection and testing company, manufacturer and applicator.
- .3 Do not perform installation during rainy or inclement weather or on wet or frost covered surfaces.
- .4 *Provide* temporary protection of the applied membrane to prevent mechanical damage or damage from spillage of oil or solvents.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Air barrier system shall perform as continuous air barrier and as liquid-water drainage plane flashed to discharge to exterior of building envelope incidental condensation or water penetration.
- .2 At wall and roof assembly transitions, air barrier system shall perform as continuous air barrier and as liquid-water drainage plane flashed to discharge to exterior of building envelope incidental condensation or water penetration by creation of unobstructed drainage plane that extends across the cladding transition or by flashing to discharge to exterior of building envelope incidental condensation or water penetration.
- .3 Air barrier system shall accommodate substrate movement, construction material changes, and transitions at perimeter conditions without deterioration which permits air and water leakage exceeding the following specified limits and requirements, or interruption of the drainage plane:
 - .1 Air permeance of air barrier material: Maximum 0.02 L/s.m² at 75 Pa (0.004 cfm/ft² at 1.57 psf) in accordance with ASTM E2178-13.
 - .2 Water vapour transmission for air / vapour barriers: Maximum 5.7 ng/Pa.m².s. (0.1 perms).
 - .3 Water vapour transmission for vapour permeable air vapour barriers: Minimum 570 ng/Pa.m².s. (10 perms).
 - .4 Air barrier system structural performance while maintaining air barrier performance for air leakage: Air barrier system shall transfer wind loads to structure and shall resist design wind load in accordance with the building code.
 - .5 Low temperature performance: Minimum -30°C (-22°F).

Air Barrier Systems

- .6 Compatibility: Air barrier system materials shall be compatible with substrate and adjacent materials with material manufacturers and show no performance deterioration during service conditions.
- .7 Self-sealability: in accordance with ASTM D1970/D1970M-21.
- .4 Air barrier system shall be joined in an airtight and flexible manner to air barrier material of adjacent building envelope air barrier systems, allowing for relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between the following unless otherwise applicable:
 - .1 Foundation and walls.
 - .2 Walls and openings (windows, doors, louvres, and other wall penetrations).
 - .3 Wall and roof systems.
 - .4 Wall and roof over unconditioned space.
 - .5 Walls, floor and roof across construction, control, and movement joints.
 - .6 Walls, floors and roof to utility, pipe and duct penetrations.

2.2 Materials - General

- .1 Single source responsibility: Materials shall be sourced from one manufacturer including sheet membranes, air barrier sealants, primers, mastics and adhesives.

2.3 Sheet-Applied, Vapour Impermeable Self-Adhesive Air Barrier Membrane System

- .1 Description: Composite preformed modified bituminous membrane system consisting of SBS modified asphalt for low temperature flexibility and polyethylene scrim reinforcing, with physical properties as follows:
 - .1 Single source responsibility: Components required for complete air barrier system and through wall flashing membrane behind the opaque wall assemblies to be obtained from single manufacturer.
 - .2 Thickness: 1.0 mm (40 mils).
 - .3 Application temperature: in accordance with manufacturers written requirements.
 - .4 Primer: in accordance with manufacturers written requirements.
 - .5 Termination and penetration sealing mastic: in accordance with manufacturers written requirements.
 - .6 Acceptable product systems:
 - .1 Henry Company 'Blueskin SA' and 'Blueskin SA LT'.
 - .2 Soprema 'Soprasedal Stick 1100 T'.
 - .3 W.R. Meadows 'Air Shield' and 'Low Temperature Air Shield'.

Air Barrier Systems

- .2 Preformed sheet membrane systems; non-bituminous:
 - .1 Description: elastomeric proprietary film with high-tack acrylic pressure sensitive adhesive, with physical properties as follows:
 - .1 Thickness: 0.25 mm (10 mils).
 - .2 Application temperature: in accordance with manufacturers written requirements.
 - .3 Acceptable *Product*:
 - .1 3M 'Self-Adhered Air and Vapour Barrier Membrane 3015', complete with 'All-Weather Flashing Tape 8067' and 'Polyurethane Sealant 540'.
 - .2 Description: composite sheet designed for use as the membrane or as a component of an air barrier system, with physical properties as follows:
 - .1 0.41 mm (16 mils) of butyl laminated to a 0.15 mm (6 mils) white high-density polypropylene film.
 - .2 Application temperature: in accordance with manufacturers written requirements.
 - .3 Material air permeance: in accordance with ASTM E2178-13.
 - .4 Assembly air leakage: in accordance with ASTM E2357-18.
 - .5 Acceptable *Product*:
 - .1 Tremco 'ExoAir 110AT'.

PART 3 - EXECUTION

3.1 Installation - General

- .1 Surfaces to receive air barrier systems shall be smooth, dry and free from conditions that will adversely affect execution, permanence, or quality of the work of this section.
- .2 Air barrier system shall be continuous in the building envelope. Lap and seal air barrier systems in accordance with product manufacturer's written installation requirements to construction, control, and expansion joints, across junctions between different building assemblies, and around penetrations through the building assembly.
- .3 Wrap into jamb, head and sill of building envelope window openings, door openings, and other openings with air barrier system membrane by returning membrane to inside face of opening unless otherwise indicated.
 - .1 Coordinate air / vapour barrier terminations of work of this section with air / vapour barrier membrane in Section 08 44 00.

Air Barrier Systems

3.2 Installation - Sheet Applied, Vapour Impermeable, Self-Adhesive Membrane

- .1 Apply self-adhering membrane continuous to prepared and primed substrate in an overlapping shingle fashion to shed moisture towards exterior and in accordance with manufacturer's written requirements.
- .2 At the end of each days work seal the top edge of the membrane where it meets the substrate using liquid air seal mastic. Trowel apply a feathered edge to seal termination and shed water.
- .3 Apply self-adhering membrane continuous across junctions between different building assemblies, and around penetrations through the building assembly. Provide overlap in accordance with manufacturer's written requirements.
- .4 Inspect membrane for punctures, misaligned seams and fishmouths, apply additional layer of membrane over affected area.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

Ceramic Cladding System

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Ventilated cladding system including:
 - .1 Modular extruded ceramic panels (CP).
 - .2 System-rails to support ceramic panels.
 - .3 Accessories: Vertical joint profiles and wall corner profiles that are part of ventilated cladding system.
 - .2 Basic support adjustable Z profiles in folded galvanized steel sheets, installed horizontally and /or vertically fastened to back wall and used as support for ventilated cladding system, supported on thermally broken support clips.
 - .3 Visible flashing and trims: water outlet flashing, external corner flashing, and flashing for transition to other building components.
 - .4 Thermal break tape and di-electric separator to avoid electrolytic effect (galvanic corrosion) between metals of different nature.
- .2 Air barrier membrane: in accordance with Section 07 27 00.
- .3 Thermal insulation: in accordance with Section 07 21 00.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate the work of this section with other sections to ensure proper scheduling for installation of the work specified herein.
 - .2 Coordinate with partition and finish sections and other *Contract Documents* to ensure that proper provisions are made for the installation of the work specified herein.
 - .3 *Provide* forms, templates, anchors, and other accessories that are required for coordination of work of other trades. Instruct applicable *Subcontractors* as to their locations.
 - .4 Take dimensions at the *Place of the Work* relative to the work of this section. Perform work of this section to suit dimensions and conditions at the *Place of the Work*.
 - .5 Coordinate manufacturing schedule with construction progress to avoid delays in the *Work*.
 - .6 Be responsible for extra work caused by, and time lost as result of, failure to give necessary cooperation, information or items to be fixed to or built-in, in adequate time as determined by construction schedule.
 - .7 Coordinate requirements for steel support members, embedded anchors, flashings and sheet metal with other work to ensure timely and accurate placement.

Ceramic Cladding System

- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
 - .2 Submit ceramic cladding panel manufacturer's written installation instructions.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Submit shop drawings, including design loads and design calculations for ceramic cladding systems, and connectors and support systems.
 - .1 Submit design of ceramic cladding panel anchorage and steel support systems.
 - .2 Include anchorage methods and sizes.
 - .3 Shop drawings shall indicate panel profiles, sizes, thicknesses, dimensions, layout, finishes, arrangement and provisions for jointing, jointing sizes, anchoring, cut-outs, flashing, and other necessary details.
 - .1 Follow arrangement of jointing shown in *Contract Documents* unless modifications are indicated on final reviewed shop drawings.
 - .2 Dimensions and details:
 - .1 Ceramic panels.
 - .2 System-rails supporting ceramic panels.
 - .3 Basic support profiles fastened to back wall and dedicated to support ceramic ventilated cladding system.
 - .4 Building signage supports.
 - .5 Cladding integrated profiles (joint profiles, wall corner profiles,).
 - .6 Prepainted folded galvanized steel sheets used as visible flashing and trims, water outlet flashing (throughwall flashing), flashing for transition to other building envelope components.
 - .7 All other ventilated ceramic cladding system components.
 - .3 Elevations:
 - .1 System component dimensions.
 - .2 Grid start point.

Ceramic Cladding System

- .3 Position and dimensions of different joint types including thermal expansion/contraction joints, building structure deflection, any other movement joints (ex: expansion/contraction between panels and system-rails, and between these and surrounding envelope components).
- .4 Position and dimensions of cuts and holes to be done in panels in order to fit panels and components passing through panels (ex. Building signage).
- .5 Position of system-rails supporting ceramic panels (required by wind load calculation results).
- .6 Position of basic support profiles and thermal clips that are fastened to back wall.
- .7 Position of visible flashing and trims, water outlet flashing, and flashing for transition to other building envelope components.
- .4 Detail drawings: Assembly axonometric views and cross section details for all work components and for junctions with other building envelope elements.
- .5 Fastening methods and devices identifying position of fixed and sliding points (for thermal expansion/contraction) on system-rails and basic support profiles.
- .6 Location of adjacent works identified with dotted lines (ex: windows, curtainwall, doors, other types of wall cladding) that have an impact on current section works such as work sequence, material compatibility, required movement joints.
- .4 Indicate locations of inserts for connectors and support systems, locations and dimensions of cut-outs, openings, flashings, and other provisions required for the work of other sections.
- .4 Samples:
 - .1 Submit 3 - 305 x 305 mm (12" x 12") size samples of each type of ceramic cladding panel, in each specified colour and finish, in accordance with Section 01 33 00. Submit samples as many times as is necessary to match *Consultant's* sample to the sole approval of the *Consultant*.
 - .2 Submit 3 - 305 mm (12") length sample of each accessory, trim and flashing components, including profiles and finish colour.
 - .3 Submit 1 sample of each component of the connectors and support systems (system-rails, support framing, and thermal clips).
 - .4 Thermal break tape and separator against electrolytic effect (galvanic corrosion) between materials of different natures.
- .5 Certificates:
 - .1 Submit sealed letter of acceptance for installed connections and ceramic cladding panels, prepared by professional engineer responsible for preparation of the shop drawings.

Ceramic Cladding System

- .2 Submit certification that completed work complies with the *Contract Documents*, the component parts are properly designed or selected for the application made, the installation methods comply with the manufacturer's written requirements and their field representative's written requirements, and the installation methods are proper and adequate for the conditions of installation and use.
- .6 Test reports:
 - .1 Non-Combustibility of ceramic according to standard CAN/ULC S114-05.
 - .2 Resistance of ceramic to freeze-thaw cycling according to standard ASTM C1026-87 signed by a qualified Canadian Professional Engineer.
 - .3 Seismic test reports:
 - .1 Supply to Consultant, seismic test reports done by an independent testing laboratory, competent in the field; give copies signed by person responsible for tests and by authorized laboratory representative.
 - .2 Supply test reports at same time as samples.
 - .3 Test mockup: Ventilated cladding system mounted on rattling table with full size ceramic panels.
 - .4 Tests:
 - .1 Seismic test on rattling table according to test procedure "GB/T21086-2007 Curtain Wall for Buildings" or other comparable test method.
 - .2 Objective to reach: During seismic simulation on mock-up submitted to seismic waves of type "El-Centro and Artificial" in X, Y and Z directions, mock-up resists without breakage to peak accelerations of 620gal.
 - .3 Objective to reach: During seismic simulation on mock-up submitted to seismic waves of type "El-Centro and Artificial" in X and Y directions, mockup resists without breakage to peak accelerations of 1000gal.

1.4 Closeout Submittals

- .1 Supply following material at Substantial Performance:
 - .1 For each ceramic panel and panel texture utilized for the work, 5% of panels installed.
- .2 Operation and maintenance data:
 - .1 *Provide* maintenance data for ceramic cladding panels for incorporation into maintenance manual in accordance with Section 01 77 00.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers: ceramic cladding panels shall be manufactured by a firm having a minimum of 20 years experience on work of similar size and quality to that indicated and specified.
 - .2 Installers / applicators / erectors:

Ceramic Cladding System

- .1 *Provide* work of this section, executed by a competent *Subcontractor* with minimum 5 years experience in design and application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .3 Coordination of this section works directly affected by following related works:
 - .1 Engineering calculations: back wall steel stud metal framing bearing capacity – metal framing, deflection, stud spacing – Section 05 41 13.
 - .2 Work sequence: completion of back wall air tightness and water tightness, completion of thermal insulation, elements passing through ceramic panels, and others.
 - .3 Wall opening finishing methods (door, curtainwall, and window perimeter closure mouldings and trims, visible flashing, water outlet flashing, parapet flashing and flashing for transition to other building envelope components).
- .2 Regulatory requirements: Materials and workmanship shall conform to requirements of jurisdictional authorities and the building code.
- .3 Colour and texture selection mock-ups:
 - .1 *Provide* 2 side-by-side mock-ups in accordance with Section 01 33 00.
 - .2 Construct each side-by-side mock 600 mm x 900 mm with Consultant's colour and texture selections, allowing for 2 colours and 2 textures.
 - .3 Include with mock-up, window frame complete with selected finish colour.
- .4 Mock-ups:
 - .1 *Provide* mock-ups in accordance with Section 01 33 00.
 - .2 Construct mock-up panel of each type of ceramic cladding panel construction, minimum 3000 mm x 3000 mm (10' x 10') in size, for reference locations as designated by *Consultant* showing colours, textures and finishes, support system, system, through-wall flashing, jointing, coursing, and other pertinent details of installation. Mock-up will serve as quality reference for prescribed work execution.
 - .1 Select ceramic cladding panels for use in mock-ups that represent the maximum variation in size, shape, texture and colour.
 - .3 Replace mock-up installations as many times as necessary until approval of installation has been obtained. Following approval, construct subsequent work of this section to conform to approved mock-up installations.
 - .4 Accepted mock-ups may remain as part of the completed *Work*.

1.6 Delivery, Storage, and Handling

- .1 Protect panels during fabrication, transportation and storage at the *Place of the Work*.
- .2 Store materials at temperatures recommended by manufacturer.
- .3 Package materials and identify on attached labels the manufacturer, contents and material specification number.

Ceramic Cladding System

- .4 Unload and store ceramic cladding panels at the *Place of the Work* in manner to avoid damage or soiling, and in accordance with manufacturer's requirements.
- .5 Cover top of completed and partially completed walls not enclosed or sheltered, with waterproof coverings at end of each *Working Day*. Drape cover over wall and extend minimum 500 mm (19-11/16") down both sides. Anchor securely in position.
- .6 Protect finished surfaces from damage.
- .7 *Provide* temporary bracing of terra cotta during erection to prevent damage due to wind or other lateral loads until permanent structure is in place. *Provide* services of a registered professional engineer where necessary to consult on temporary bracing.

1.7 Field Conditions

- .1 Obtain and comply with ceramic cladding *Supplier's* advice for optimum temperature and humidity conditions at the *Place of the Work* for terra cotta panels during its storage and installation. Do not install ceramic cladding panels until these conditions have been attained.

PART 2 - PRODUCTS

2.1 Manufacturer

- .1 All material and components part of ventilated cladding system shall come from a single manufacturer.
- .2 Acceptable products; ceramic cladding:
 - .1 Basis of design:
 - .1 Agrob Buchtal KeraTwin System as distributed by Ceragres Tile Group Inc. - 'Keratwin K20 Panel' with Keratwin K20 Omega System Rails.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.2 Performance/Design Requirements

- .1 Design responsibility: be fully responsible for the design, structural engineering, calculations, shop drawings, fabrication, installation, warranties, and certification and submittal procedures.
 - .1 This section is responsible for design and calculation all basic support profiles, reinforcements, anchors and fasteners to all back wall types and all other elements according to performance requirements mentioned below.
 - .2 Coordinate calculations with back wall bearing frame and structure (back wall steel stud metal frame, concrete, steel structure, etc.) onto which prescribed ventilated cladding will be fastened.
- .2 Design ceramic panel ventilated cladding system in order to:
 - .1 Allow thermal expansion/contraction of components in an ambient temperature range of – 40 C degrees to 65 C degrees (especially between ceramic panels, between ceramic panels and system-rails and basic support profiles, between basic support profiles and back wall frame and structure).

Ceramic Cladding System

- .2 Avoid any permanent deformation, excessive stress on fastening devices, on ceramic panels and on any other cladding system component, and avoid causing buckling/deformation/breakage of ceramic panels or any other wearing.
- .3 Allow thermal expansion joints to absorb expansion/contraction movements between cladding ceramic panels and between ceramic panels and building back wall frame and structure attributable to movements of back wall frame and structure itself, without any permanent deformation, damage to materials and joint breakage.
- .3 Wind loads: Positive and negative wind loads applied on building and caused by greatest winds likely to occur at this location for 1/50 years, post disaster design.
 - .1 Maximum deflection under wind loads for assembly of ventilated cladding system and metal frame: deflection equal or less than 1/200.
- .4 Design ceramic panel system according to open joint ventilated cladding system principle to ensure proper flow towards exterior of building of condensation water forming into wall internal air cavity and rain water penetrating through cladding joints.
- .5 Design ceramic panel cladding system taking into account back wall frame/structure existing conditions and tolerances prescribed for support element assembly.
- .6 Ceramic panels shall be non-combustible to CAN/ULC S114.
- .7 Loads shall be in accordance with the building code for building classification - 'Post-Disaster Building'.
- .8 Design panel systems to accommodate specified erection tolerances of structure.
- .9 Design ceramic cladding panels for dry-set panel anchoring and support system. Visible fasteners or fastening on exposed ceramic cladding panel faces not permitted.
- .10 Design ceramic cladding panels to allow for non-sequential removal of individual ceramic cladding panel components.
- .11 Design ceramic cladding panels and fabrications to prevent damage from contact during window cleaning building maintenance operations.

2.3 Materials

- .1 General:
 - .1 Single-source manufacturing responsibility: Engage a qualified manufacturer to assume undivided responsibility for the work of this section.
- .2 Ceramic cladding:
 - .1 Extruded ceramic panels with fastening grooves on back surface, Precision, according to requirements of DIN EN 14411 (ISO 13006) standard, Annex B, Group A1a, Part1.
 - .2 Ceramic panel physical properties:
 - .1 Thickness: minimum 20 mm.
 - .2 Dimensional tolerances:

Ceramic Cladding System

- .1 Length (up to 1800 mm): +/- 1 mm.
- .2 Height (up to 600 mm): +/- 2 mm.
- .3 Straightness of edges: +/- 1.5 mm.
- .4 Thickness: +/- 1 mm.
- .5 Surface flatness: +/- 0.4 .
- .6 Rectangularity: +/- 0.3 %.
- .3 Weight: 32 kg/m² (6.5lbs/ft²).
- .4 Breaking strength: ≥ 3300 Newton (according to DIN EN ISO 10545-4).
- .5 Resists to freeze/thaw effects.
- .6 Light- and colour-fast, resistant to UV light.
- .7 Building material class: non-combustible.
- .3 Colours and surface textures:
 - .1 Unglazed ceramic tile with through body colour.
 - .2 CP1 and CP2: Allow for 3 colours and 3 textures, to later selection by Consultant from full colour and grooved texture range.
- .4 Heights and lengths: Refer to Drawings.
- .3 System-rails: System-Rails installed vertically on horizontal adjustable basic support profiles.
 - .1 Rails designed to allow replacement of any ceramic panel regardless of its position in the grid, without need of special tools, without removing adjacent panels, without breaking panels, without re-installing any component other than new replacement panel.
- .4 Thermally broken façade substructure:
 - .1 System shall provide façade substructure with the following attributes:
 - .1 Thermally broken.
 - .2 Meet requirements of the building code for non-combustible construction.
 - .3 Adjustable to permit façade alignment tolerances.
 - .4 Corrosion resistant performance.
 - .5 Suitable for rear ventilated rain screen façade design.
 - .2 Z-girt and sub-girts: Preformed Z275 galvanized metal sheet, 1.22 mm (18 gauge) minimum base steel nominal thickness, notched for drainage, to ASTM A653/A653M-13, Grade A.
 - .3 Thermally broken spacer systems:
 - .1 Basis of design:
 - .1 IsoClip 'Thermal Isolation Clip'.

Ceramic Cladding System

- .5 Vertical rail system on channel supports:
 - .1 Attachment hooks to align panels when installed.
 - .2 Acceptable *Product*:
 - .1 Keratwin 'Omega System Rail K20'. Vertical rail systems by other specified ceramic cladding manufacturers is acceptable.
 - .3 Accessories: as recommended by ceramic cladding manufacturer.
 - .4 Stainless steel self-tapping screw #10 / 4.8mm,(for fixed and sliding points), to fasten system-rails on horizontal support profiles.
- .6 Wall corner finish:
 - .1 Manufacturer standard item:
 - .1 Wall corner finish profiles
 - .1 Material: folded/punched aluminum alloy AlMg3 H22.
 - .2 Factory painted black.
 - .3 Profile types:
 - .1 Sword corner profile: item #652.
 - .2 Mitre-cut panels (45 degrees), factory made by system manufacturer, for wall corner finish.
- .7 Metal mesh hidden behind ceramic cladding to keep rodents and other small animal (birds, etc) away from getting behind panels through holes and apertures left by flashing, parapet flashing and other moulding and trims.
- .8 Accessories required to perform ventilated ceramic panel installation work including adjustment shims.
- .9 Internal metal wall flashing: Prefinished steel flashing in accordance with Section 07 62 00.
- .10 Cavity compartmentalization dividers:
 - .1 Formed 22 gauge Z275 zinc coated or AZ150 Galvalume steel sheet metal.
 - .2 Fasteners: Galvanized steel rivets or screws.
 - .3 Sealant: in accordance with Section 07 92 00.
- .11 Through-wall flashing membrane:
 - .1 Sheet membrane:
 - .1 Description: Composite preformed modified bituminous membrane system consisting of SBS modified asphalt for low temperature flexibility and polyethylene scrim reinforcing, with physical properties as follows:
 - .1 Single source responsibility: Components required for complete air barrier system and through wall flashing membrane behind the opaque wall assemblies to be obtained from single manufacturer.

Ceramic Cladding System

- .2 Thickness: 1.0 mm (40 mils).
- .3 Application temperature: in accordance with manufacturers written requirements.
- .4 Primer: in accordance with manufacturers written requirements.
- .5 Termination and penetration sealing mastic: in accordance with manufacturers written requirements.
- .6 Acceptable product systems:
 - .1 Carlisle Coatings & Waterproofing 'CCW 705'.
 - .2 GCP Applied Technologies 'Perm-A-Barrier Wall Membrane'.
 - .3 Henry Company 'Blueskin SA' and 'Blueskin SA LT'.
 - .4 Soprema 'Sopraseal Stick 1100 T'.
 - .5 W.R. Meadows 'Air Shield' and 'Low Temperature Air Shield'.
- .12 Thermal break tape at locations shown in drawings: [self-adhesive neoprene tape, strength Shore 70, 3.2mm thick by width of contact surfaces.]
- .13 Dielectric separator (Isolation material): Non-staining alkali resistant, 10 mil PVC membrane type, electrolytic isolation factor of 1.0.
- .14 Thermal spacers at through wall flashing: 13 mm HDPE or PVC.
- .15 Air barrier: in accordance with Section 07 27 00.
- .16 Exterior sheathing board: in accordance with Section 09 29 00.

2.4 Fabrication

- .1 Fabricate ceramic cladding panels in accordance with reviewed shop drawings.
 - .1 Cuts and holes in ceramic panels:
 - .1 Ceramic panels will be pre-cut at manufacturer factory at required length by steps of 1mm.
 - .2 If on-site cuts are required, use a wet saw equipped with porcelain blade according to manufacturer's recommendations.
 - .3 To allow components to pass through ceramic panels, precisely cut and pierce holes considering required clearance to avoid contact with ceramic panels, taking into account thermal movements of panels.
 - .4 If piercing holes in ceramic panels is required, to get a clean finish round hole use a diamond bit and drill ceramic panel while immersed into water. Using a dry buffer will create a visually unequal look hole which will need to be hidden by a trim or moulding.
 - .5 Cleaning after on-site cut:

Ceramic Cladding System

- .1 When ceramic panels are cut on-site, clean panels using clean water and a soft nylon brush (do not use abrasive brush); rinse well all panel surfaces, back grooves and central channels to remove all traces of cut debris or residues, immediately after cutting panels without waiting for residues to dry, and before proceeding with ceramic panel installation.
- .2 Follow manufacturer cleaning recommendations to avoid damaging panel surface.
- .3 Failing the on-site cut cleaning procedure, after installation rain will wash cut residues out of panels and leave visible stains on external panel.
- .4 On-site 45 degrees mitre-cuts are not allowed: they will be part of ceramic panel order and made at manufacturer's factory.
- .2 Panel joints; vertical and horizontal: 8 mm unless otherwise indicated on drawings.
- .3 Source quality control:
 - .1 After fabrication and prior to packing for shipment, carefully inspect ceramic cladding pieces for chips, cracks, and other defects. Verify dimensions comply with shop drawing dimensions and finishes match approved samples.
 - .2 Verify ceramic cladding panels meet fabrication tolerances.

PART 3 - EXECUTION

3.1 Examination

- .1 Ensure compatibility of *Products* supplied under this section, and which bear contact with substrate.
- .2 Examine substrate surfaces to receive the work of this section and ensure that work of other sections is complete and that there are not conditions that will adversely affect the performance of this work. Notify *Consultant* in writing of unsatisfactory conditions. Do not proceed with work of this section until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of surfaces and conditions.
- .3 Carefully inspect ceramic cladding panels for colour variation. Ceramic cladding panels presenting noticeable variations shall be carefully selected, set aside and used in areas where they fit in the pattern homogeneously. *Provide* for appropriate lighting equipment in addition to existing lighting in the immediate area where the installation is being performed so that any shade differences which are normally very slight can be identified easily.
- .4 Suspect ceramic cladding panels, miscalibrated panels, panels with chipped corners, and panels with holes shall be put aside for inspection by manufacturer and be replaced on a panel for panel basis prior to installation.
- .5 Install work of this section after air barrier system and insulation are complete and have been reviewed by *Consultant*.
- .6 Repair of chipped ceramic cladding panels will not be permitted except in exceptional circumstances and at sole discretion of *Consultant*.

Ceramic Cladding System

3.2 Air Barrier Membrane Application

- .1 Install in accordance with Section 07 27 00.

3.3 Insulation

- .1 Install in accordance with Section 07 21 00.

3.4 Preparation

- .1 Securely attach anchors, hangers, bolts, clips, rods, and pins as required for securing ceramic cladding panels. Use type of fastener and at spacing recommended by ceramic cladding manufacturer and as indicated on reviewed shop drawings.
- .2 Review locations of ceramic cladding panel coursing alignment and layout with *Consultant*, and seek approval, prior to commencement of the work of this section.

3.5 Compartmentalization Dividers

- .1 The wall cladding assemblies have been designed to function as pressure-equalized rainscreen wall systems.
- .2 Provide cavity compartmentalization dividers to divide wall cavity air space at exterior wall assemblies to allow rapid pressure equalization within controlled areas of the wall assembly.
- .3 Locate in wall cavity air space to achieve an air movement seal between air/vapour barrier membrane and the exterior cladding assembly. Overlap metal divider joints 25 mm (1"), mechanically fasten and seal airtight with sealant.
- .4 Mechanically fasten with fasteners located at 300 mm (12") on centre. Seal over fasteners airtight with sealant.

3.6 Installation

- .1 Install ceramic cladding panel system in accordance with panel manufacturer's written requirements and in accordance with reviewed shop drawings.
 - .1 Follow closely manufacturer installation instructions.
 - .2 Before proceeding with system-rail installation, exterior faces of horizontal support profiles must form a uniform and homogeneous plan: maximum allowed shift in flatness of external face of two adjacent horizontal support profiles shall be less than 1 mm.
 - .3 Fasten system-rails on horizontal basic support profiles while following prescribed grid; if required install adjustment shims and adjust according to prescribed tolerances.
- .2 Units with chips, cracks, stains, or other defects that might be visible in the finished work will not be used.
- .3 In areas exposed to high wind loads defined by this section engineer, install additional system-rails at mid ceramic panel length in required areas.

Ceramic Cladding System

- .4 Install basic support profiles on back wall respecting location and positioning shown in drawings according to fixed and sliding point position for predicted thermal and structural movements, and adjust according to prescribed tolerances:
 - .1 Maximum allowed deviation in component flatness is 6mm/10 meters of length and up to 20 mm/100 meters.
 - .2 Maximum allowed shift in alignment of two adjacent components, butted in same plan, shall be inferior to 1 mm.
- .5 Before setting, ceramic cladding panels shall be clean and free of cutting debris, dirt, and foreign matter.
- .6 Attach anchors to backup framing/substrate in sequence required by support system.
- .7 Through-wall flashings and sheet metal flashing: As work progresses, install through-wall flashings and sheet metal flashings.
- .8 The use of any sealant/caulking on ceramic panel ventilated cladding is strictly prohibited.

3.7 Installation Tolerances

- .1 Maintain the following installation tolerances:
 - .1 Maximum variation from plane or location indicated on reviewed shop drawings: 20 mm (3/4") / 10 m (32.8') of length and up to 30 mm (1-3/16") / 100 m (3937") maximum.
 - .2 Maximum offset from true alignment between 2 adjacent panels abutting end-to-end, in line: 1 mm (0.039").

3.8 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Inspection and testing:
 - .1 Independent inspection and testing company shall perform inspection of completed work.
- .3 Manufacturer's field review to be in accordance with Section 01 45 00.
 - .1 Manufacturer's field representative shall inspect ceramic cladding panel installation, identify defects, and submit written report to *Consultant* in accordance with Section 01 45 00. Correct deficiencies identified by *Consultant* and manufacturer's field representative.

3.9 Cleaning

- .1 Clean ceramic panel cladding according to manufacturer recommendations.
- .2 Once installation is done, general cleaning using clean water and soft nylon brush is required; do not use abrasive brush. Rinse well all surfaces with clean water. Cleaning shall not damage any component of ceramic panel system.
- .3 In case of tougher dirt areas, contact supplier.

END OF SECTION

Aluminum Panel Cladding System

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Aluminum panel cladding.
 - .2 Metal (aluminum) panel soffits; SF1.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate with installers of wall mounted items, equipment, and mechanical and electrical work so that installation will not subvert the integrity of the cladding system.
 - .2 Coordinate interface, transition, lapping, flashings and compatibility of membranes with work of Section 07 27 00.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Indicate panel layout, elevations, dimensions, attachment and anchoring materials and methods, trim and closure pieces, detail and location of joints, sealants and gaskets; include joints necessary to accommodate thermal movement, flashing, accessories and related work of this section.
 - .3 Indicate reflected ceiling plans, types of suspension systems and locations of inserts and openings, termination of walls, bulkheads and lighting fixtures, including coves and access panels.
 - .4 Indicate methods to achieve watertight assembly, including sealants, penetration seals, drainage path of moisture from within assembly to exterior of envelope.
 - .5 Indicate materials, finishes, and colours.
- .4 Samples:
 - .1 Submit 2 - 610 x 610 mm (24" x 24") size samples of panel material, of each colour specified.
 - .2 Submit samples of each component of system. Samples shall fully represent materials to be supplied in colour, texture, finish, profile and construction.

Aluminum Panel Cladding System

- .3 Submit samples and load test data and design tables for each type of insert and soffit panel.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit maintenance and cleaning instructions for inclusion in the maintenance manuals.
- .3 Maintenance materials:
 - .1 At completion, submit 10% extra of soffit panels area.
 - .2 Pack panels in suitably marked containers and store where directed for future use by *Owner*. Clearly identify containers listing the types of panels. Note date.
 - .3 Extra stock shall be same production run as installed material.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*:
 - .1 Has adequate plant, roll forming machinery, equipment, and skilled workers to perform it expeditiously.
 - .2 Has successfully completed installations similar to that specified during a period of at least the immediate past 5 years.
 - .2 Manufacturer:
 - .1 Company with in-house production facilities specializing in manufacturing *Products* specified in this section, with 10 years' experience, minimum.

1.6 Delivery, Storage, and Handling

- .1 Comply with AAMA CW-10 – Care and Handling of Architectural Aluminum from Shop to Site.
- .2 Store materials at temperatures recommended by manufacturer.
- .3 Store roll materials on end.
- .4 Package materials and identify on attached labels the manufacturer, contents and material specification number.
- .5 Store flammable solvent-base liquids away from excessive heat and open flame. Primer contains solvent. Do not use near open flame.

1.7 Field Conditions

- .1 Comply with manufacturer's requirements.

Aluminum Panel Cladding System

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

.1 Design:

- .1 Design cladding systems and finishes for expansion and contraction of the system and component materials produced by an exterior surface temperature range of -35°C to +60°C.
- .2 Design cladding system to accommodate and withstand the following without permanent deformation or damage to, or failure of, cladding system or building structure:
 - .1 Deflection of cladding system due to uniformly distributed specified loads shall not exceed $L/90$ of the span for walls, except as follows:
 - .1 Soffits: Design for maximum deflection of $1/360$ of span.
 - .2 Movement within cladding system, and between cladding system and building structure.
 - .3 Cladding system dead loads, snow loads, ice loads, and wind loads, and combinations thereof, in accordance with the building code.
 - .1 Design wind loads shall be based on at least $1/50$ hourly wind pressure values as indicated in building code and greater values as required, to maximum allowable deflection without permanent deformation.
- .3 Design to allow positive drainage of condensation occurring within cladding system to exterior of building envelope or drainage outlet.
- .4 Design to allow positive drainage of water to exterior of building envelope or drainage outlet.
- .5 Design wall system and secondary support structure as required to accommodate specified erection tolerances of the structure.
- .6 Design system to meet tolerances specified.
- .7 Panel joinery:
 - .1 Dry-seal, rainscreen joints.
- .8 No visible fasteners, telegraphing or fastening on panel faces or any other compromise of neat and flat appearance.

.2 Performance:

- .1 Comply with the following performance requirements:
 - .1 Flame-spread rating: Not more than 25 in accordance with CAN/ULC-S102-10.
 - .2 Metal fasteners shall be corrosion resistant.
 - .3 *Provide* drip detail over windows and door heads, copings, at edges of overhangs, to direct moisture to exterior.

Aluminum Panel Cladding System

- .4 Wall system to utilize drain systems to positively drain water from within wall system to exterior.
- .2 Paint system; except at soffits:
 - .1 Colour shall not fade more than 5 Hunter units when tested according to ASTM D2244-16.
 - .2 Chalking shall not be in excess of a No. 8 rating when tested according to ASTM D4214-07(2015).
 - .3 No cracking, checking, peeling, or failure of paint to adhere to bare metal.
- .3 Soffits:
 - .1 System shall be corrosion resistant.
 - .2 Panels shall not discolour.
 - .3 Provide reinforced backing to maintain panel flatness and resist wind pressure loading, resist panel fluttering.
 - .4 Brace suspension system to maintain panel alignment laterally and provide means to prevent uplift of panels.

2.2 Materials - Panel System

- .1 Aluminum panels; aluminum flat sheet; solid type:
 - .1 Aluminum flat sheet: Aluminum flat sheet in accordance with ASTM B209-14, 3.17 mm (0.125") thick panels in the following alloy:
 - .1 Painting quality: 3003-H14 or 3105-H14 in accordance with ANSI H35.1/H35.1M-2017.
 - .2 System types:
 - .1 Concealed fastener with dry joints.
- .2 SF1; Aluminum panel soffit system:
 - .1 Description: Solid face planks, no perforations. linear pans with reveals, snap-in installation, exterior application.
 - .2 Aluminum flat sheet: Aluminum flat sheet in accordance with ASTM B209/B209M-21a.
 - .3 Spacing: 16 mm (5/8") reveal between panels.
 - .4 Panel width: to match CLG-WDLK.
 - .5 Panel length: 2438 mm (96") with 15.9 mm (5/8") reveal.
 - .6 Filler strip: Manufacturer's standard recessed strip to fill space between panels.
 - .7 Configuration: as indicated.
 - .8 Installation: Snap-in method, staggered panels.
 - .9 Acceptable *Product*:

Aluminum Panel Cladding System

- .1 USG 'Ceiling Plus Planx - Linear Metal Suspended Ceiling System - Exterior'.
- .2 Substitutions: in accordance with Section 01 25 00.

2.3 Accessories

- .1 Aluminum accessory sheet-metal and flashing components:
 - .1 Aluminum sheet: Aluminum flat sheet in accordance with ASTM B209-14, to the following minimum thickness and alloy:
 - .1 Thickness:
 - .1 1.016 mm (0.040").
 - .2 Painting quality: 3003-H14 or 3105-H14 in accordance with ANSI H35.1/H35.1M-2017.
 - .2 Extruded aluminum accessory components:
 - .1 Aluminum extrusions in accordance with ASTM B221-14, to the following minimum wall thickness and alloy:
 - .1 Thickness:
 - .1 2.28 mm (0.090").
 - .2 Alloy: 6063-T52.
 - .3 Support brackets: Steel brackets to be hot dipped galvanized with zinc coating (0.09 g/m (3.4 mil)) in accordance with CAN/CSA G164-M92.
 - .4 Fasteners: Self-tapping, stainless steel screws.
 - .5 Insulation:
 - .1 Semi-rigid insulation: rock wool type, in accordance with Section 07 21 00.
 - .6 Air barrier membrane: in accordance with Section 07 27 00.
 - .7 Thermally broken façade substructure:
 - .1 System shall provide façade substructure with the following attributes:
 - .1 Thermally broken.
 - .2 Meet requirements of the building code for non-combustible construction.
 - .3 Adjustable to permit façade alignment tolerances.
 - .4 Corrosion resistant performance.
 - .5 Suitable for rear ventilated rain screen façade design.
 - .2 Z-girt and sub-girts: Preformed Z275 galvanized metal sheet, 1.22 mm (18 gauge) minimum base steel nominal thickness, notched for drainage, in accordance with ASTM A653/A653M-11, Grade A.
 - .3 Z-girt shall be prepainted black for added corrosion resistance.
 - .4 Thermally broken spacer systems:
 - .1 Basis of design:

Aluminum Panel Cladding System

- .1 IsoClip 'Thermal Isolation Clip'.
- .8 Sub-girts (z-girts): minimum 1.2 mm (18 gauge) zinc-coated steel to ASTM A653/A653M-11 with Grade A coating Z275.
- .9 Isolation coating: Bituminuous paint.
- .10 Trim, coping, closures, panel splines, and cap pieces:
 - .1 3.18 mm (0.125") aluminum, to match cladding system.
 - .2 Factory fabricate components, ready for installation.
- .11 Fasteners: Self-tapping, purpose made stainless steel screws.

2.4 Finishes - Cladding

- .1 Exposed aluminum surfaces: 70% Kynar 500 or Hylar 5000 fluoropolymer resin systems, ceramic pigments and other select inorganic pigments in accordance with AAMA 2605-17a.
 - .1 Acceptable *Products*:
 - .1 PPG 'Duranar'.
 - .2 Sherwin-Williams 'Fluropon'.
 - .2 Colour to later selection by *Consultant* from manufacturer's full range. Colour shall be:
 - .1 Solid.

2.5 Finishes - Soffit

- .1 Soffits (SF-1):
 - .1 Exposed aluminum surfaces:
 - .1 Laminate on metal finish (Sarante).
 - .2 Colour: S23N Golden Birch Sarante.

2.6 Fabrication

- .1 Form to profiles indicated on drawings and to conform with reviewed shop drawings.
- .2 Construct panel lines, breaks, and angles sharp and true, and surfaces free from warp and buckle.
- .3 Allow for structural movements within the systems, and to accommodate thermal expansion and contraction between panels and structural members.
- .4 Fabricate systems to prevent entry of water into building and from collection within system assembly.
- .5 Join intersecting parts together to achieve tight, accurately fitted joints with adjoining surfaces in true planes.
- .6 Fabricate system to conform to requirements of reference standards specified.

Aluminum Panel Cladding System

- .7 Co-operate with applicable sections to ensure all co-ordination required for proper installation of work of this section in conjunction with and incorporated with other work.
- .8 Lay out panels to obtain uniform metal and laminate/paint grain finish. Mark direction of metal grain and paint application on back of panels.

2.7 Fabrication Tolerances

- .1 Comply with the following maximum tolerances:
 - .1 Plumb: 3.2 mm in 3 m (1/8" in 10'-0"); 6.4 mm in 12.2 m (1/4" in 40'-0").
 - .2 Level: 3.2 mm in 3 m (1/8" in 10'-0"); 6.4 mm in 12.2 m (1/4" in 40'-0").
 - .3 Alignment:
 - .1 Where surfaces abut in line or are separated by reveal or protruding element up to 12.7 mm (1/2") wide, limit offset from true alignment to 1.6 mm (1/16").
 - .2 Where surfaces are separated by reveal or protruding element from 12.7 to 25.4 mm (1/2" to 1") wide, limit offset from true alignment to 3.2 mm (1/8").
 - .3 Where surfaces are separated by reveal or protruding element of 25.4 mm (1") wide or more, limit offset from true alignment to 6.4 mm (1/4").
 - .4 Variation from plane: 3.2 mm in 3.6 m (1/8" in 12'-0"); 12.7 mm (1/2") over total length.
 - .5 Panels:
 - .1 Bow: 0.2% of panel dimensions up to 3.2 mm (1/8") maximum.
 - .2 Indicated size:
 - .1 Up to 1220 mm (4'-0"): plus/minus 0.76 mm (0.030").
 - .2 1220 mm to 3050 mm (4'-0" to 10'-0"): plus/minus 1.52 mm (0.060").
 - .6 Square or rectangular: Maximum 3.2 mm (1/8") difference between diagonal measurements.
 - .7 Variation from indicated position: plus/minus 3 mm (1/8").
- .2 Tolerances shall not be cumulative.

PART 3 - EXECUTION

3.1 Examination

- .1 Take site measurements to ensure that work of this section is fabricated to fit structure; surrounding construction; around obstructions and projections in place, or as shown on drawings; and to suit locations of services.
- .2 Verify that backup construction is aligned for proper installation of work of this section before commencing erection.
- .3 Notify *Consultant* in writing of conditions detrimental to proper and timely completion of work. Do not proceed with erection until unsatisfactory conditions have been corrected.

Aluminum Panel Cladding System

3.2 Air Barrier Membrane Application

- .1 Install in accordance with manufacturer's installation requirements and in accordance with Section 07 27 00.
- .2 Surfaces must be smooth, clean dry and free from loose contaminants. Brushing and/or scraping of block and concrete surfaces may be required to adequately prepare surface.
- .3 Apply primer for membrane work.
- .4 Wrap openings with membrane returning to inside face of openings.
- .5 Ensure air barrier seals into adjacent systems for complete air barrier to building envelope.

3.3 Insulation

- .1 Install insulation in accordance with manufacturer's installation requirements and in accordance with Section 07 21 00.
- .2 Carefully cut and fit insulation in pieces to fit surfaces of members to which insulation bears contact.
- .3 Cut backs of pieces as required to fit over projecting anchors, fastenings or similar protrusions. Fit boards neatly with tight joints around pipes, ducts, obstructions, openings, corners, and structural members.
- .4 Apply insulation to ensure total and complete coverage of surfaces indicated to be insulated, and in direct contact with such surfaces.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

3.4 Installation - Cladding

- .1 Erect systems complete with flashings forming part of the system, clips, fasteners, closures and caulking to meet same design criteria as specified for fabrication.
- .2 Erect panels in straight lines that are true, level, square, and plumb.
- .3 Attachment system: Allow for free and noiseless vertical and horizontal thermal movement due to expansion and contraction. Buckling of panels, opening of joints, undue stress on fasteners, failure to sealants or any other detrimental effects due to thermal movement is not permitted. Allow for ambient temperature at time of fabrication, assembly and erection procedures.
- .4 Anchor cladding securely as per engineering recommendations and in accordance with reviewed shop drawings to allow for necessary thermal movement, wind loading and structural support.
- .5 Seal between work of this section and work of other sections to meet specified requirements of Section 07 92 00 and to achieve a watertight installation.
- .6 Cut, flash, and apply sealant to system penetrations. Seal around materials penetrating metal cladding watertight.

Aluminum Panel Cladding System

- .7 Install various components within cladding assembly to provide positive controlled drainage of moisture to exterior of building envelope or drainage outlet.
- .8 Conceal fasteners.
- .9 Do not install component parts that are observed to be defective, including warped, bowed, dented, and broken members.
- .10 Obtain panel symmetry whenever possible relative to openings in both vertical and horizontal plane.
- .11 Brake form metal flashings to profile required, in maximum lengths.
- .12 Install head and sill flashings, edge trim, cap pieces and other formed profiles as applicable and/or detailed.
- .13 Do not cut, trim, weld or braze component parts during erection in manner that would damage finish, decrease strength or result in a visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
- .14 Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.
- .15 Protect surface of metals in contact with concrete, mortar, plaster or other cementitious surface with isolation coating.

3.5 Installation – Soffit

- .1 Installation in accordance with manufacturer's written installation requirements.
- .2 Install end caps at sight-exposed ends of soffit panels.

3.6 Installation Tolerances

- .1 Comply with the following maximum tolerances:
 - .1 Plumb: 3.2 mm in 3 m (1/8" in 10'-0"); 6.4 mm in 12.2 m (1/4" in 40'-0").
 - .2 Level: 3.2 mm in 3 m (1/8" in 10'-0"); 6.4 mm in 12.2 m (1/4" in 40'-0").
 - .3 Alignment:
 - .1 Where surfaces abut in line or are separated by reveal or protruding element up to 12.7 mm (1/2") wide, limit offset from true alignment to 1.6 mm (1/16").
 - .2 Where surfaces are separated by reveal or protruding element from 12.7 to 25.4 mm (1/2" to 1") wide, limit offset from true alignment to 3.2 mm (1/8").
 - .3 Where surfaces are separated by reveal or protruding element of 25.4 mm (1") wide or more, limit offset from true alignment to 6.4 mm (1/4").
 - .4 Variation from plane: 3.2 mm in 3.6 m (1/8" in 12'-0"); 12.7 mm (1/2") over total length.
 - .5 Panels:
 - .1 Bow: 0.2% of panel dimensions up to 3.2 mm (1/8") maximum.

Aluminum Panel Cladding System

- .2 Indicated size:
 - .1 Up to 1220 mm (4'-0"): plus/minus 0.76 mm (0.030").
 - .2 1220 mm to 3050 mm (4'-0" to 10'-0"): plus/minus 1.52 mm (0.060").
- .6 Square or rectangular: Maximum 3.2 mm (1/8") difference between diagonal measurements.
- .7 Variation from indicated position: plus/minus 3 mm (1/8").
- .2 Tolerances shall not be cumulative.

3.7 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

3.8 Adjusting and Cleaning

- .1 After erection, touch up coatings removed or damaged during erection.
- .2 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.
- .3 Clean exposed surfaces in accordance with manufacturer's written requirements.
- .4 Remove excess sealant with recommended solvent.

3.9 Protection

- .1 Protect panels during fabrication, transportation, storage at the *Place of the Work* and erection.

END OF SECTION

Metal Cladding Systems

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Prefinished metal siding system; MP1.
 - .2 Prefinished metal soffit; SF2.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate with installers of wall mounted items, equipment, and mechanical and electrical work so that installation will not subvert the integrity of the cladding system.
 - .2 Coordinate interface, transition, lapping, flashings and compatibility of membranes with work of Section 07 27 00.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .2 Indicate dimensions, cladding profiles, attachment and anchoring materials and methods, trim and closure pieces, fascia, material finishes and colours, and related work.
 - .3 Indicate methods to achieve watertight assembly, including sealants, penetration seals, drainage path of moisture from within assembly to exterior of envelope.
- .4 Samples:
 - .1 Submit 2 - 915 mm x 1220 mm (36" x 48") size samples of cladding materials, of each colour and profile specified.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*.
 - .1 Has adequate equipment, and skilled workers to perform the work expeditiously.

Metal Cladding Systems

- .2 Has successfully completed installations similar to that specified during a period of at least the immediate past 5 years.

1.5 Delivery, Storage, and Handling

- .1 Store materials at temperatures recommended by manufacturer.
- .2 Store bundles of panels raised on pallets, and sloped to drain.
- .3 Package materials and identify on attached labels the manufacturer, contents and material specification number.
- .4 Store flammable solvent-base liquids away from excessive heat and open flame. Primer contains solvent. Do not use near open flame.

1.6 Field Conditions

- .1 Comply with CSSBI's installation requirements.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design to CAN/CSA S136-16 and building code.
- .2 Design for expansion and contraction of component materials of the *Work* produced by an exterior surface temperature range of -35°C to +60°C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .3 Design cladding system to accommodate and withstand the following without permanent deformation or damage to, or failure of, cladding system or building structure:
 - .1 Deflection of cladding system due to uniformly distributed specified loads shall not exceed L/90 of the span for walls.
 - .2 Movement within cladding system, and between cladding system and building structure.
 - .3 Cladding system dead loads, snow loads, ice loads, and wind loads, and combinations thereof, in accordance with the building code.
 - .1 Design wind loads shall be based on at least 1/50 hourly wind pressure values as indicated in building code and greater values as required, to maximum allowable deflection without permanent deformation.
- .4 Design to allow positive drainage of condensation occurring within cladding system to exterior of building envelope or drainage outlet.
- .5 Design to allow positive drainage of water to exterior of building envelope or drainage outlet.
- .6 Design metal systems to the Architectural Sheet Metal Manual by SMACNA unless otherwise indicated.
- .7 Design wall system and secondary support structure to accommodate specified erection tolerances of the structure.

Metal Cladding Systems

- .8 Design system to meet tolerances specified.

2.2 Materials

- .1 Preformed steel cladding; fabricated from preformed sheet metal as follows:
 - .1 Metal sheet:
 - .1 Zinc coated sheet steel: sheet steel to ASTM A653/A653M-13 with coating designation Z275 (G90) to ASTM A924/A924M-22a unless otherwise indicated.
 - .1 Preformed metal minimum thickness for prefinished metal siding: 0.76 mm (22 gauge) base steel nominal thickness.
 - .2 Preformed metal minimum thickness for prefinished metal soffit: 0.61 mm (24 gauge) base steel nominal thickness.
 - .2 Accessories and hardware: Zinc coated steel to meet specified requirements of ASTM A123/A123M-13, hot dip galvanized after fabrication.
 - .3 Acceptable profile:
 - .1 MP1; Prefinished metal siding:
 - .1 Basis of design: Vicwest 'AD 300R'.
 - .2 Colour: to later selection by *Consultant*.
 - .2 SF2; Prefinished metal soffit:
 - .1 Basis of design: Vicwest 'Bellara Steel Siding Plank 135', 20% perforated.
 - .2 Colour: Cambridge White.
 - .2 Thermally broken façade substructure:
 - .1 System shall provide façade substructure with the following attributes:
 - .1 Thermally broken.
 - .2 Meet requirements of the building code for non-combustible construction.
 - .3 Adjustable to permit façade alignment tolerances.
 - .4 Corrosion resistant performance.
 - .5 Suitable for rear ventilated rain screen façade design.
 - .2 Z-girt and sub-girts: Preformed Z275 galvanized metal sheet, 1.22 mm (18 gauge) minimum base steel nominal thickness, notched for drainage, to ASTM A653/A653M-13, Grade A.
 - .3 Thermally broken spacer systems:
 - .1 Basis of design:
 - .1 IsoClip 'Thermal Isolation Clip'.

Metal Cladding Systems

- .3 Accessories: exposed trim, end and flute closures, cap pieces, flashings, and the like, of same metal material and finish, and colour as prefinished metal panels, unless otherwise indicated.
- .4 Insulation:
 - .1 Semi-rigid in accordance with Section 07 21 00.
- .5 Air barrier membrane: in accordance with Section 07 27 00.
- .6 Exposed sealants: in accordance with Section 07 92 00.
- .7 Gaskets: soft, pliable, cold weather grade, PVC foam, extruded profile for outer sheet.
- .8 Fasteners:
 - .1 Self-drilling, Type 304 stainless steel.
 - .2 Head finish:
 - .1 Type 304 stainless steel, in concealed locations.
 - .2 Prepainted metal, colour to match prefinished metal panels in exposed locations.

2.3 Metal Finishes

- .1 Prefinished sheet finish:
 - .1 MP1; Prefinished metal siding:
 - .1 Painted finish: Silicone modified polyester, with ceramic pigments and other select inorganic pigments, 2-coat system.
 - .1 Coating shall exhibit zero cracking, chipping, or peeling (lose adhesion) that is visible in ordinary outdoor visual observations (within 10 metres to the unaided naked eye) for 40 years from date of installation. This does not include minute fracturing that may occur during the normal fabrication process.
 - .2 Coating chalk more than a number 8 rating in vertical installations and shall not chalk in excess of a number 6 rating in non-vertical installations, in accordance with ASTM D-4214-98 method A at any time for 30 years from date of installation, 30.5 yrs from application of coating.
 - .3 Coating shall not change colour more than 5.0 Hunter ΔE units in vertical installations and not more than 7.0 Hunter ΔE units in non-vertical installations, in accordance with ASTM D2244-16.
 - .4 Acceptable *Products*:
 - .1 ArcelorMittal Dofasco 'Perspectra Plus Series'.
 - .2 Baycoat 'Perspectra Plus Series'.
 - .3 Sherwin-Williams 'WeatherXL'.
 - .4 Vicwest 'WeatherXL'.
 - .5 Substitutions: in accordance with Section 01 25 00.

Metal Cladding Systems

- .2 SF2; Prefinished metal soffit:
 - .1 Acceptable *Product*.
 - .1 Vicwest 'Signature'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.4 Fabrication

- .1 Form to profiles indicated on drawings and to conform to reviewed shop drawings.
- .2 Construct panel lines, breaks, and angles sharp and true, and surfaces free from warp and buckle.
- .3 Allow for structural movements within the systems, and to accommodate thermal expansion and contraction between panels and structural members.
- .4 Ensure that metal panels are free of steel contamination from rollers.
- .5 Fabricate siding panel systems to prevent entry of water into building and from collection within system assembly.
- .6 Join intersecting parts together to provide tight, accurately fitted joints with adjoining surfaces in true planes.
- .7 Fabricate formed and notched metal closures to close-off flutes at exterior. Seal also with neoprene foam filler.
- .8 Cooperate with applicable sections to ensure coordination required for proper installation of work of this section in conjunction with and incorporated with other work.
- .9 Fabricate metal cladding panels in one length; maximum 6000 mm (20') for horizontal application; 12000 mm (40') for vertical application; unless otherwise indicated.
- .10 Prefinished metal panel terminations shall not have a raw metal edge or exposed fasteners. Panel ends for non-corrugated panels shall be folded.

PART 3- EXECUTION

3.1 Examination

- .1 Take measurements at the *Place of the Work* to ensure that the work of this section is fabricated to fit structure, surrounding construction, around obstructions and projections in place.
- .2 Verify that backup construction is aligned for proper installation of prefinished metal panel system before commencing erection.

3.2 Air Barrier Membrane Application

- .1 Install in accordance with manufacturer's written installation requirements and in accordance with Section 07 27 00.
- .2 Surfaces must be smooth, clean dry and free from loose contaminants. Brushing and/or scraping of block and concrete surfaces may be required to adequately prepare surface.
- .3 Apply primer for membrane work.

Metal Cladding Systems

- .4 Wrap openings with membrane returning to inside face of openings.
- .5 Ensure air barrier seals into adjacent systems for complete air barrier to building envelope.
- .6 Seal around materials penetrating membrane in accordance with manufacturer's written requirements.

3.3 Insulation

- .1 Install insulation in accordance with manufacturer's written installation requirements and in accordance with Section 07 21 00.
- .2 Cut backs of pieces as required to fit over projecting anchors, fastenings or similar protrusions. Fit boards with tight joints around obstructions, openings, corners, and structural members.
- .3 Apply insulation to ensure total and complete coverage of surfaces indicated to be insulated, and in direct contact with such surfaces.
- .4 Use largest possible dimensions to reduce number of joints.

3.4 Cladding System Installation

- .1 Erect systems complete with flashings forming part of the system, clips, fasteners, closures and sealant to meet same design criteria as specified for fabrication.
- .2 Erect panels in straight lines that are true, level, square, and plumb to comply with installation tolerances.
- .3 Attachment system: Allow for free and noiseless vertical and horizontal thermal movement due to expansion and contraction for material temperature range. Buckling of panels, opening of joints, undue stress on fasteners, failure to sealants or any other detrimental effects due to thermal movement is not permitted. Allow for ambient temperature at time of fabrication, assembly and erection procedures.
- .4 Anchor cladding securely per engineering recommendations and in accordance with reviewed shop drawings to allow for necessary thermal movement, wind loading and structural support.
- .5 Install sealant between work of this section and work of other sections to meet specified requirements of Section 07 92 00 and to provide a watertight installation.
- .6 Cut, flash, and apply sealant to system penetrations. Seal around materials penetrating metal cladding watertight.
- .7 Install various components within cladding assembly to provide positive controlled drainage of moisture to exterior of building envelope or drainage outlet.
- .8 Conceal fasteners.
- .9 Do not install component parts that are observed to be defective, including warped, bowed, dented, and broken members.
- .10 Obtain panel symmetry whenever possible relative to openings in both vertical and horizontal plane.
- .11 Break form metal flashings to profile required, in maximum lengths.

Metal Cladding Systems

- .12 Install head and sill flashings, edge trim, cap pieces and other formed profiles as applicable and detailed.
- .13 Apply sealant to face of supports for top and bottom closure flashings and at supports for perimeter closure flashings and returns.
- .14 Do not cut, trim, weld or braze component parts during erection in manner that would damage finish, decrease strength or result in a visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
- .15 Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.
- .16 Protect surface of metals in contact with concrete, mortar, plaster or other cementitious surface with isolation coating.
- .17 Install metal soffits in accordance with Engineered shop drawings for support of system. Install liner metal soffit panels in accordance with 09 54 23.

3.5 Metal Cladding Installation Tolerances

- .1 Maintain the following installation tolerances:
 - .1 Maximum variation from plane or location shown on reviewed shop drawings: 20 mm (3/4")/10 m (32.8') of length and up to 30mm (1-1/6")/100 m (328') maximum.
 - .2 Maximum offset from true alignment between two adjacent members abutting end to end or side-by-side, in line: 1 mm (0.039").
 - .3 Flatness: Maximum deviation from flatness shall be 3.2 mm (1/8") in 1520 mm (5') on panel in any direction for assembled units.

3.6 Adjusting and Cleaning

- .1 After erection, touch up coatings removed or damaged during erection.
- .2 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.
- .3 Wash down exposed interior and exterior surfaces using solution of mild domestic detergent in warm water, applied with soft clean wiping cloths. Wipe interior surfaces clean as part of final clean-up.
- .4 Remove excess sealant with recommended solvent.

3.7 Protection

- .1 Protect prefinished steel during fabrication, transportation, storage at the *Place of the Work* and erection, in accordance with CSSBI Standards.

END OF SECTION

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Two-ply styrene-butadiene-styrene (SBS) modified bituminous membrane roofing assembly; as follows:
 - .1 Protected membrane roofing system with ballast cover.
 - .2 Associated roofing accessories and *Products*.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate with Divisions 21, 22, and 23 to ensure that roof drains are suitable for roofing system design.
 - .2 Coordinate with installers of roof mounted items, equipment, and mechanical and electrical work at roof so that installation will not subvert the integrity of the roofing system.
 - .3 Coordinate with installation of air barrier at walls to ensure complete continuity of air barrier system for building. Roofing air barrier membrane to lap by 75 mm (3") minimum and terminate with wall system air barrier membrane.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.
 - .2 The manufacturer shall meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the roofing assembly.
 - .3 Meet with *Consultant*, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - .4 Review methods and procedures related to roofing installation, including manufacturer's written requirements.
 - .5 Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - .6 Examine substrates and existing conditions for compliance with requirements, including flatness and fastening.
 - .7 Review structural loading limitations of roof deck during and after roofing.
 - .8 Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .9 Review governing regulations and requirements for insurance and certificates if applicable.
- .10 Review temporary protection requirements for roofing system during and after installation.
- .11 Review roof observation and repair procedures after roofing installation.
- .12 Forecasted weather conditions.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for each type of product indicated.
- .3 Roofing manufacturer's warranty and design criteria:
 - .1 Submit roofing manufacturer's warranty specimen and warranty design criteria prior to commencement of roofing work.
- .4 Shop drawings; engineered for wind (uplift) loads:
 - .1 Submit engineered wind uplift design shop drawings in accordance with Section 01 33 00.
 - .2 Include description of materials and assemblies, and other pertinent information.
 - .3 Design uplift loads shall be indicated on the shop drawings.
- .5 Design calculations; for wind (uplift) loads:
 - .1 Submit under seal, calculations prepared by the professional engineer responsible for the preparation of the engineered shop drawings that clearly indicate the following:
 - .1 Design assumptions.
 - .2 Codes and standards to which calculations are based upon.
 - .3 Materials.
 - .4 Maximum and minimum tolerances for proposed materials including anchors and spacing.
 - .5 Testing data to substantiate compliance with wind (uplift) design requirements.
- .6 Shop drawings; general details:
 - .1 Include plans, elevations, sections, details, and attachments to other work for the following:
 - .1 Base flashings, cants where required, drain detailing, membrane terminations and penetrations.
 - .2 Tapered insulation, including slopes.
 - .3 Crickets, saddles, and tapered edge strips, including slopes.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .4 Wood blocking substrates details for metal flashings and fastening methods.
- .5 Metal flashing details attachment and fastening methods.
- .6 Decorative roof ballasting requirements and details to resist displacement or scour of ballasted assemblies.
- .7 Certificates:
 - .1 Installer certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
 - .2 Manufacturer certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - .1 Submit evidence of compliance with performance requirements.
- .8 Roofing manufacturer's warranty sample and wind uplift compliance reports:
 - .1 Manufacturer's pre-installation notification: Submit copy of completed roofing manufacturer's pre-installation notification form at least 10 *Working Days* prior to commencement of roofing installation.
 - .2 Warranty sample: Submit copy of roofing manufacturer's warranty specimen including warranty requirements prior to commencement of roofing installation.
 - .3 Roofing assembly wind uplift compliance reports: Submit roof system assessment reports for applicable CSA A123.21 compliant roof assemblies required to meet requirements for indicated wind uplift pressures and indicated roofing assembly configurations.
- .9 Samples:
 - .1 Submit samples complete with manufacturer's labels intact, of materials to be used for work of this section prior to commencement of work. Allowing ample time for review and acceptance by *Consultant* and roofing inspection company. Do not proceed with work until samples are accepted.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's maintenance instructions for incorporation into the operation and maintenance manuals.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers: Company specializing in manufacturing the *Products* specified in this section, with minimum 10 years experience.
 - .2 Installers / applicators / erectors:

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 *Subcontractor*: Shall be a member in good standing of the Canadian Roofing Contractors Association (CRCA) and Ontario Industrial Roofing Contractors Association (OIRCA).
- .3 Roofing *Subcontractor* must be approved by the membrane manufacturer for the warranty program specified. Submit *Subcontractor's* certification letter prepared by the membrane manufacturer.
- .2 Execute work of this section only under full time supervision of qualified *Subcontractor's* site supervisor.

1.6 Delivery, Storage, and Handling

- .1 Deliver roofing materials to *Project* site in original containers with seals unbroken and labelled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- .2 Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written requirements for handling, storing, and protecting during installation.
- .3 Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
- .4 Handle materials carefully to preclude damage. Follow manufacturer's written recommendations.
- .5 Package materials and identify on attached labels the manufacturer, brand, contents, weight as applicable, and *Product* and specification numbers.
- .6 Protect edges of roll goods from damage during handling, and store rolls on end to prevent flattening.
- .7 Do not store roofing materials on roof. Store them in a dry area protected from inclement weather while roofing installation is not in progress. Store above materials under opaque, breathable and waterproof tarpaulins or in sheds.
- .8 Prevent compression of insulation panels at any point and breakage of edges and corners. Discard wet, cupped, bowed, or otherwise damaged insulation from *Place of the Work*.

1.7 Field Conditions

- .1 Weather limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written requirements and warranty requirements.

1.8 Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Extended warranty:

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .1 Roofing manufacturer shall provide total system warranty:
 - .1 Issue a written document in the *Owner's* name, valid for duration listed below, for the repair of leaks in the roofing system to restore the roofing system to dry and watertight condition, to the extent that manufacturing or installation defects caused water infiltration.
 - .2 Entire cost of the repair(s) required to maintain dry and watertight roofing system during the full warranty duration.
 - .3 Labour, materials, and workmanship for the work of this section.
 - .4 Non-prorated with no dollar limit (NDL) for duration of warranty.
 - .5 Duration: 20 years.

PART 2 - PRODUCTS

2.1 Roofing System Manufacturer

- .1 General:
 - .1 Single source responsibility: each roofing component to be by one manufacturer.
- .2 Acceptable roof system manufacturers, subject to compliance with requirements of the *Contract Documents*:
 - .1 Henry Company.
 - .2 Johns Manville.
 - .3 Tremco Incorporated.
 - .4 Soprema.

2.2 Performance/Design Requirements - General

- .1 Roofing system: The roofing system shall include roofing system materials required to achieve roofing membrane manufacturer's warranty.
- .2 Roofing materials, components, and assemblies shall resist environmental and wind (uplift) loads, and effects of those loads in accordance with the building code.
- .3 General performance: Installed roofing system and base flashings shall withstand wind uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing system and base flashings shall remain watertight.
- .4 Material compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- .5 Roofing system: Prevent water from entering building and roofing assembly through roofing membrane.
- .6 Roofing system design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according the building code.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .7 Roof covering classification: Roof assembly shall have a Class C classification as determined in conformance with CAN/ULC S107-10 "Standard Methods of Fire Tests of Roof Coverings".
- .8 Air barrier system shall accommodate substrate movement, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding the following specified limits and requirements:
 - .1 Air permeance of air barrier material: Maximum 0.02 L/s m² at 75 Pa (0.004 cfm/ft² at 1.57 psf) in accordance with ASTM E2178-13.
 - .2 Water vapour transmission for air / vapour barriers: Maximum 5.7 ng/Pa.m².s. (0.1 perms).
 - .3 Pull-off strength of liquid or sheet applied membrane and laps: Cohesive or substrate failure permitted when tested to specified wind load. Air barrier system shall transfer wind load to structure and shall resist 100% of design wind load or minimum of 2.15 kPa (45 psf), whichever is greater.
 - .4 Low temperature flexibility: to -30°C (-22°F) in accordance with CGSB 37-GP-56M-1985.
- .9 Air barrier system shall be joined in an airtight and flexible manner to air barrier material of adjacent building envelope air barrier systems, allowing for relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between the following unless otherwise applicable:
 - .1 Walls and openings.
 - .2 Across construction, control, and expansion joints.
 - .3 Penetrations.

2.3 Roof Membrane and Flashing Sheets

- .1 Roofing membrane requirements:
 - .1 The use of thermofusible (torched) base sheet and cap sheet membranes and flashing membranes is not permitted.
- .2 Roofing membrane base sheet: At *Contractor's* option, use either site applied base sheet or cover board with shop applied base sheet, but use only one type throughout the *Work*.
 - .1 Cover board with integral (shop applied) base sheet; liquid adhesive installed:
 - .1 High performance base sheet composed of SBS modified bitumen, non-woven polyester reinforced membrane, factory-laminated on semi-rigid asphaltic board.
 - .2 Membrane thickness: 2 mm minimum.
 - .2 Roof membrane base sheet and base sheet flashing: SBS-modified asphalt membrane sheet with reinforced elastomeric bitumen:
 - .1 CSA A123.23-15, Type C, Grade 3, composite reinforced.
- .3 Roof membrane base sheet and base sheet flashing: SBS-modified asphalt membrane sheet with reinforced elastomeric bitumen:

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .1 CSA A123.23-15, Type C, Grade 3, composite reinforced.
- .4 Roofing membrane cap sheet and cap sheet flashing: SBS-modified asphalt membrane sheet with reinforced elastomeric bitumen, protected by coloured granules:
 - .1 CSA A123.23-15, CGSB 37.56 Type C, Grade 1, composite reinforced.
- .5 Roofing cap sheet membrane shall be surface covered with granules:
 - .1 Granule colour: as selected by *Consultant*.

2.4 Roofing Assembly Materials - Protected Membrane Roofing

- .1 Substrate (sheathing) board:
 - .1 Provide either glass-mat faced substrate board or fibre-reinforced substrate board in accordance with roofing manufacturer's written requirements and recommendations for use as substrate for adhering roofing membrane components.
 - .2 Substrate board; glass-mat faced board: in accordance with ASTM C1177/C1177M-13, glass-mat, water-resistant gypsum substrate.
 - .1 Acceptable *Products*:
 - .1 CGC 'Securock Glass-Mat Roof Board'.
 - .2 Georgia Pacific 'Dens Deck'.
 - .3 Substitutions: in accordance with Section 01 25 00.
 - .3 Substrate board; fibre-reinforced board: in accordance with ASTM C1278/C1278M-17, fibre-reinforced, water-resistant gypsum board.
 - .1 Acceptable *Products*:
 - .1 USG 'Securerock Gypsum-Fiber Roof Board'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .2 Air and vapour barrier:
 - .1 Self-adhering sheet:
 - .1 In accordance with ASTM D1970/D1970M-18, minimum of 0.8 mm (30-mil) thick, polyethylene film laminated to layer of rubberized asphalt adhesive; cold-applied, with slip-resisting surface and release paper backing. *Provide* primer when recommended by sheet manufacturer.
- .3 Drainage board; horizontal applications:
 - .1 Characteristics:
 - .1 High density drainage panel with woven, factory laminated geotextile.
 - .2 Compressive strength: 862 kPa (18,000 psf).
 - .2 Acceptable *Product*:
 - .1 Soprema 'Sopradrain 18-G'.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .4 Roof insulation (INSUL-6):
 - .1 General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
 - .2 Rigid polystyrene insulation; protected membrane roofing insulation:
 - .1 Extruded polystyrene board in accordance with CAN/ULC S701.1-17, Type 4, closed cell type, with integral high density skin.
 - .1 Thermal resistance: Long term aged RSI value of 0.87/25 mm.
 - .2 Board size: 610 mm x 2440 mm (24" x 48").
 - .3 Compressive strength: Minimum 240 kPa (35 psi).
 - .4 Water absorption: 0.7% by volume maximum, in accordance with ASTM D2842-12.
 - .5 Edges: Ship lapped.
 - .3 Tapered insulation: Provide factory-tapered insulation boards fabricated to slope of 1:48 (1/4 inch per 12 inches) unless otherwise indicated.
 - .4 Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, and no less than 1:48 (1/4 inch per 12 inches) in addition to roof structure slope or to tapered insulation slope as applicable.
- .5 Protected membrane roofing aggregate ballast and ballast scrim:
 - .1 Diffusion membrane (ballast reducing scrim fabric/flotation fabric):
 - .1 100% woven HDPE fabric, UV stabilized, water permeable, 0.5 mm (2 mil) thickness, with a tensile strength of 400 N, approved by roof insulation manufacturer for protected membrane roofing systems, minimum of 65% diffusion open.
 - .2 Aggregate ballast:
 - .1 Ballast to be freeze-thaw stable.
 - .2 ASTM D448: Standard Size of Coarse Aggregate, aggregate nominal size #2, or larger sizes where required by engineered shop drawings.
 - .1 Stone: Grey coloured limestone.
- .6 Cover board; where cover board with integral base sheet is not being used:
 - .1 Cover board; multi-ply, semi-rigid asphaltic roofing substrate board: Mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners.
 - .2 Thickness: Use 3.2 mm (1/8") at horizontal condition and 6.4 mm (1/4") at vertical conditions, unless otherwise indicated.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

2.5 Auxiliary Roofing Membrane Materials

- .1 General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing system.
- .2 Mastic sealant: Polyisobutylene, plain or modified bitumen, non-hardening, non-migrating, non-skinning, and non-drying.
- .3 Metal flashing sheet: Metal flashing sheet is specified in Section 07 62 00.
- .4 Miscellaneous accessories: Provide miscellaneous accessories recommended by roofing manufacturer.
- .5 Primer: in accordance with manufacturers written requirements.
- .6 Fasteners and restraints:
 - .1 General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing system.
 - .2 Factory-coated steel fasteners and plates complying with corrosion-resistance provisions in FM 4470, designed for fastening roofing components to substrate, tested by manufacturer for required pullout strength and wind uplift resistance, and acceptable to roofing manufacturer.
 - .3 Termination bars: Pre-punched aluminum bar 25 mm (1") wide x 1.5 mm (1/16") thick x 3048 mm (10 ft) long with 6.4 mm (1/4") x 9.5 mm (3/8") slotted holes on 200 mm (8") centres.
- .7 Cant strips: as recommended by membrane manufacturer.
- .8 Waterproofing sealer and penetration flashing membrane:
 - .1 Description: One component polyurethane or bitumen/polyurethane waterproofing coating complete with polyester or glass mat reinforcement fabric to form reinforced field membrane.
 - .2 Primer: as recommended by manufacturer.
 - .3 Embedded granule finish: Colour and application to match adjacent cap sheet membrane.

2.6 Precast Pavers

- .1 Precast paver slabs: in accordance with CSA A231.1-19/A231.2-19, 610 mm (24") square, slip resistant textured finish, minimum 45 MPa (6526 psi) compressive strength, minimum 4.5 MPa (653 psi) (mean) flexural strength, minimum 4.5% (by mass) water absorption, maximum allowable average loss of mass of not greater than 50 g/m² (0.16 oz/ft²) after 28 cycles.
 - .1 Thickness: as required by engineered shop drawings for wind uplift.
- .2 Precast support pads: 25 mm (1") thick, extruded expanded polystyrene insulation, in accordance with CAN/ULC S701.1-17, Type 4, Class B, self-extinguishing, 35 psi at 5% deflection compressive strength.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

2.7 Expansion Joints (EXPJT1)

- .1 Description:
 - .1 Manufactured from a proprietary copolymer with internal polyester reinforcement, monolithic seam vulcanization.
 - .2 Movement and fabrication: Tri-directional movement capability, joint waterproofing system shall be factory fabricated in one piece for the entire contiguous expansion joint or where length of joint exceeds manufacturer's shipping and handling guidelines shall be lapped and vulcanized by manufacturer's mechanics on site, repair of damaged materials shall be performed by manufacturer's mechanics.
 - .3 Compatible with adhesives and membranes associated with expansion joint construction in accordance with manufacturer's installation requirements.
 - .4 Warranted by manufacturer to cover full warranty duration specified in this section.
 - .5 Hydrostatic pressure limit: Working pressure in column of water shall perform under static limit not to exceed 10 m (33ft).
 - .6 50 mm joint for +/- 25 mm movement.
- .2 Acceptable products; to suit type of roofing assembly and movement design requirements:
 - .1 Basis of design:
 - .1 Situra Inc. 'FlamLINE'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .3 Acceptable manufacturers:
 - .1 Situra Inc.
 - .2 Soprema.
 - .3 Substitutions: in accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Examination

- .1 Examine substrates, areas, and conditions, with roofing installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - .1 Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - .2 Verify that blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - .3 Metal deck:
 - .1 Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00.
 - .4 Proceed with installation only after unsatisfactory conditions have been corrected.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

3.2 Preparation

- .1 Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing manufacturer's written requirements. Remove sharp projections.
- .2 Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 Installation - General

- .1 Prepare surfaces and complete waterproofing work in conformance with roofing manufacturer's written requirements.
- .2 Install roofing system elements on clean and dry surfaces, in conformance with manufacturer's written requirements.
- .3 Roofing system work must be completed in a continuous fashion as surfaces are readied and weather conditions permit.
- .4 Seal seams that are not covered by a cap sheet membrane in the same day. Do not install cap sheet when moisture is present at/in the base sheet seams.
- .5 Ensure waterproofing conditions for roofs at all times, including protection during installation work by other trades and progressive protection as work is completed (e.g. vents, drains, and other work which penetrates roofing membrane.).
- .6 Lay roofing membrane free from wrinkles, air pockets, fishmouths, tears, and prominent lap joints. Full bond cap sheet to base sheet. Seams shall be lapped and fully bonded.
- .7 Prior to installation of base sheet and cap sheet, allow sheet to relax after unrolling. Relax time to be as recommended by manufacturer based on concurrent ambient temperature.
- .8 Extend roofing to outer edges of roof and up vertical surfaces at least 200 mm (8") above horizontal roofing, and full height beneath counter flashing and top of curb flashing.
- .9 Complete roofing up to line of termination for each day's work.
- .10 Roofing systems adhered with cold adhesive, and where insulation at bottom of vertical upstand is greater than 150 mm (6") in thickness: Install continuous fastening bar and anchors at bottom of vertical upstand (screws and plates with length greater than 150 mm (6") are not permitted).

3.4 Substrate Board (Sheathing/Underlay)

- .1 Lay substrate board with tightly butted joints. Longitudinal joints must be at right angles to flute direction. Joints occurring along widths of board to be continuously supported on top flange of metal deck. Stagger end joints of adjacent board by 1/2 the board width.
- .2 Ensure substrate board is immediately protected with membrane.
- .3 Mechanical fasteners to penetrate top flutes only; by no less than 19 mm (3/4") and by no more than 25.4 mm (1"). Check underside of deck before installation to eliminate damaging existing conditions below deck.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

3.5 Application of Primer

- .1 Roofing substrates surfaces shall receive a coat of primer at a rate required by roofing manufacturer's written requirements.
- .2 Surfaces to be primed must be free of rust, dust or any residue that may hinder adherence.
- .3 Cover primed surfaces with roofing membrane as soon as possible (same day coverage for self-adhesive membranes).

3.6 Air and Vapour Barrier

- .1 Self-adhering sheet: Prime substrate if required by manufacturer. Install self-adhering sheet over area to receive sheet, side and end lapping each sheet a minimum of 90 mm (3-1/2") and 150 mm (6"), respectively. Seal laps by rolling.
- .2 Completely seal air and vapour barrier at terminations, obstructions, and penetrations to prevent air movement into roofing.

3.7 Cover Board

- .1 Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 300 mm (12") in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
- .2 Where cover board with integral base sheet is being used:
 - .1 Install in accordance with manufacturer's written requirements. Apply insulation adhesive to underside and immediately bond board to substrate.

3.8 Installation of Roofing Membrane and Roofing Membrane Flashings

- .1 Tape substrate joints in substrate to prevent the passage of flame using flame guard tape.
- .2 Install membrane in accordance with manufacturer's requirements.
- .3 Install roofing membrane free of wrinkles, air pockets or fishmouths. Provide homogenous seam.
- .4 Cut off corners at end laps to be covered by the next roll.
- .5 Install a reinforcing gusset in all inside and outside corners.
- .6 Seal overlaps at the end of the workday.
- .7 After installation of cap sheet, check lap seams on cap sheet.

3.9 Roofing Details

- .1 Install as indicated on drawings and with various roofing details illustrated in roofing manufacturer's written requirements.

3.10 Waterproof Expansion Joint Installation

- .1 Install all components of the system in accordance with the manufacturer's written requirements.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .2 The system is to be wholly encapsulated between the plies of the modified bitumen membrane in a roofing system.

3.11 Roof Drains

- .1 Ensure that roof drains are set to permit drainage, located at lowest possible location, and properly secured. Cut and slope insulation at each drain to form a sump and to accommodate flashing immediately surrounding drain. Review final locations with *Consultant* prior to installation of drains.
- .2 Drain sumps:
 - .1 Install tapered insulation. Drain sumps to be 2400 mm (96") unless otherwise indicated on drawings.
 - .2 Apply waterproofing sealer (penetration flashing) membrane to drain sump area, complete with fleece reinforcing fabric to form reinforced field membrane.
 - .3 Embed coloured granules to match installation to granulated roofing cap sheet.
- .3 Temporarily block drain pipes during application of membrane. Remove blocking when work is not in progress and after work of this section is completed.
- .4 Carry membrane and insulation to edge of drain base and trim around drain opening. Top ply to be granulated cap sheet flashing to minimum 200 mm (8") from edge of drains.
- .5 Ensure that installation of drain and membrane is performed in accordance with recommendations of drain manufacturer.
- .6 Prime drain flange and allow to dry.
- .7 Embed first felt ply in a coat of waterproofing mastic and extend plies of felt into the drain opening of drains, and trim as required.
- .8 Fill void between drain body and roof insulation board/base structure support with two-component polyurethane foam insulation.

3.12 Roof Penetrations

- .1 Install curb flashings around ducts, pipes, structural steel, and other projections through membrane systems in conformance with manufacturer's written requirements and as detailed.
- .2 Install penetration flashing supplied under work of mechanical and under the work of this section, in accordance with roofing manufacturer's installation requirements.
- .3 Prime metal flanges with primer and allow solvents to flash off prior to installation.
- .4 Remove poly film on areas to receive metal flashing. Set metal flange in full layer of waterproofing mastic to provide positive bond and seal.
- .5 Install base ply to the base of the metal flashing staying short of curved metal section.
- .6 Install cap ply to the base ply flashing ensuring a full bond to the base ply and apply bead of waterproofing sealer at the termination point.
- .7 Install penetration flashing membrane and fleece in accordance with manufacturer's requirements.

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

3.13 Metal Flashings

- .1 Install metal flashings in accordance with Section 07 62 00.

3.14 Insulation and Aggregate Ballast - Protected Membrane Roofing

- .1 Install drainage sheet in accordance with manufacturer's written requirements.
- .2 Install insulation unbonded over substrate.
- .3 Do not install insulation until roof membrane has been inspected and tested.
- .4 Apply insulation boards parallel to roof perimeter edges.
- .5 Lay each succeeding layer of insulation with joints staggered from layers below, by at least 200 mm (8").
 - .1 Lay rigid insulation in layers of equal thickness.
- .6 Lay insulation boards with edges in moderate contact without forcing. Cut insulation to fit to perimeters and penetrations through roof, with maximum allowable gap of 6 mm (1/4").
- .7 Apply no more insulation than can be covered by ballast in same day.
- .8 Keep insulation minimum 75 mm (3") from heat emitting devices, and 50 mm (2") from sidewalls of CAN/ULC S604-M91 Type A chimneys and CAN/CSA B149.1-10 and CAN/CSA B149.2-10(R2015) Type B and L vents; if applicable.
- .9 Install single layer of filter fabric over insulation boards prior to application of ballast.
 - .1 Overlap seams minimum 300 mm (12").
 - .2 Extend filter fabric up perimeter edges, cants, and roof protrusions a minimum of 100 mm (4") and place un-bonded under counter flashing.
 - .3 Minimum size of fabric shall be 2440 mm x 2440 mm (96" x 96") if small pieces must be used.
 - .4 Slit fabric over roof penetrations. Cut out around roof drains and other openings.
 - .5 Filter fabric shall be installed flat without wrinkles or ripples.
- .10 Apply a heavy coat of light coloured exterior acrylic latex paint where insulation may become exposed, such as at roof drains.
- .11 Ballast installation:
 - .1 To roofed area, apply aggregate ballast uniformly over scrim fabric at rate required by insulation manufacturer, and greater amounts as required by engineered shop drawings. Apply ballast as insulation is installed, leaving roofing insulated and ballasted at end of workday.

3.15 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and as follows:
 - .1 Inspection and testing:

Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing

- .1 Prior to installation of cap sheet membrane, base sheet membrane installation shall be reviewed by manufacturer and inspection and testing company, who shall each submit field review reports to the *Consultant*.
- .2 Independent inspection and testing company shall perform:
 - .1 Inspections and provide inspection reports.
 - .2 Tests and provide test reports:
 - .1 Core cuts (if requested).
 - .3 Moisture survey:
 - .1 Submit results of a non-destructive moisture test of roof system completed by approved third party. Utilizing one of the approved methods:
 - .1 Infrared Thermography.
 - .2 Nuclear Backscatter.
- .2 If test results or inspections show roofing does not comply with requirements, remove and replace or repair the roofing as recommended in writing by manufacturer, and make further repairs after retesting and inspecting until roofing installation passes.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.16 Adjusting and Cleaning

- .1 Remove applicator's equipment and debris as work progresses, and at completion of the work of this section in accordance with Sections 01 77 00 and 01 74 13.
- .2 Remove bituminous markings from finished surfaces.
- .3 Repair or replace defaced or disfigured finishes caused as a result of the work of this section.

END OF SECTION

Metal Flashing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Supply and installation of prefinished steel flashings.
 - .2 Supply and installation of prefinished aluminum flashings.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Shop drawings:
 - .1 Submit shop drawings including the following:
 - .1 Plans, elevations, sections, and attachment details.
 - .2 Detail fabrication and installation layouts, expansion-joint locations, and key details. Distinguish between shop and field assembled work.
 - .3 Include identification of material, thickness, weight, and finish for each item and location in the work.
 - .4 Include details for forming, including profiles, shapes, seams, and dimensions.
 - .5 Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - .6 Include details of termination points and assemblies.
 - .7 Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contracting from fixed points.
 - .8 Include details of roof penetrations flashing.
 - .9 Include details of edge conditions, and counter flashings as applicable.
 - .10 Include details of special conditions.
 - .11 Include details of connections to adjoining work.
- .3 Samples:
 - .1 Submit full-size samples of each specified flashing material formed to detailed profile including corner, curb, cap, and parapet flashing, and coping including lock-joints and hold-down clips.
 - .2 Submit 2 - 50 mm x 50 mm (2" x 2") samples of each type of sheet metal material, colour and finish.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:

Metal Flashing

- .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval of *Product* manufacturers.
- .2 Sealant shall be applied by a *Subcontractor* of recognized standing, having preferably not less than 5 years of proven experience in this type of work, and who has the necessary equipment and skilled mechanics to carry out the work of this section satisfactorily and can substantiate this to satisfaction of *Consultant*.
- .2 Quality standards:
 - .1 Quality of fabrication and installation of sheet metal work shall comply with recommendations published by National Roofing Contractors Association.
 - .2 Quality of fabrication and installation of sheet metal work shall comply with recommendations published by Sheet Metal and Air Conditioning Contractors National Association.

1.4 Delivery, Storage, and Handling

- .1 Keep materials and equipment free from debris, ice, snow and contaminants. Allow air to circulate around metal components, sheets and break shapes.
- .2 Protect holes, and reglets from water and ice during freezing weather.

PART 2 - PRODUCTS

2.1 Prefinished Steel Flashing

- .1 Sheet steel: Commercial quality to ASTM A653/A653M-13 with Z275 designation zinc coating.
 - .1 Minimum thickness: 0.45 mm (0.0179") (26 gauge) except as follows:
 - .1 At parapets: 0.76 mm (0.0299") (22 gauge).

2.2 Prefinished Aluminum Flashing

- .1 Aluminum flat sheet: Flat aluminum sheet in accordance with ASTM B209-14, to the following minimum thickness and alloy:
 - .1 Painting quality: 3003H14 or 3105H14 to ANSI H35.1/H35.1M-2017.
 - .2 Minimum thickness:
 - .1 1.02 mm (0.040").
 - .1 At parapets: 1.27 mm (0.050").

2.3 Prefinished Metal Finishes

- .1 Provide the following finish to exposed prefinished steel:
 - .1 Finish: Silicone polyester, with ceramic pigments and other select inorganic pigments, 2-coat system.

Metal Flashing

- .1 Coating shall not crack, chip, or peel (lose adhesion) for 40 years from date of installation, 40.5 yrs from application of coatings. This does not include minute fracturing that may occur during the normal fabrication process.
- .2 Coating shall not chalk in excess of a number 6 rating, in accordance with ASTM D4214-07(2015) method D659 at any time for 30 years from date of installation, 30.5 yrs from application of coating.
- .3 Coating shall not change colour more than 8.0 Hunter ΔE units as determined by ASTM D2244-22.
- .4 Colour to later selection by *Consultant* from manufacturer's full range.
- .5 Acceptable *Products*:
 - .1 ArcelorMittal Dofasco 'Perspectra Series'.
 - .2 Baycoat 'Perspectra Plus Series'.
 - .3 Firestone Metal Products (SMP or Kynar).
 - .4 Sherwin-Williams 'WeatherXL'.
- .2 Provide the following finish to exposed prefinished aluminum:
 - .1 Exposed aluminum surfaces: 70% Kynar 500 or Hylar 5000 fluoropolymer resin systems, ceramic pigments and other select inorganic pigments to AAMA 2605-17a.
 - .1 PPG 'Duranar XL'.
 - .2 Sherwin-Williams 'Fluorpon Classic'.
 - .2 Colour:
 - .1 Colour to later selection by *Consultant* from manufacturer's full range.

2.4 Accessories

- .1 Isolation coating: to CAN/CGSB-1.108, bituminous type.
- .2 Sealants:
 - .1 Exposed sealants: Silicone in accordance with Section 07 92 00, colour as selected by *Consultant* from manufacturer's full range.
 - .2 Concealed flashing sealants; hooked-type expansion joints with limited movement: Butyl sealant to ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied.
- .3 Cleats: of matching metal to flashing material, continuous, and of greater thickness than flashing material. Offset joints in cleats 305 mm (12") with joints in perimeter edge metal. Allow a 12.7 mm (1/2") gap between pieces.
- .4 Fasteners:
 - .1 Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

Metal Flashing

- .2 General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head:
 - .1 Exposed screws: 38 mm (1-1/2") long minimum at 450 mm (18") on centre maximum. Heads matching colour of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM washer under heads of exposed fasteners.
 - .2 Blind fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - .3 Cleat fasteners: Corrosion-resistant barbed angular ring or screw shank nail; length to achieve approximately 32 mm (1-1/4") penetration into nailer.
- .3 Fasteners for prefinished aluminum sheet: Aluminum or Series 300 stainless steel.
- .4 Fasteners for prefinished galvanized steel sheet: Series 300 stainless steel or hot dip galvanized steel to ASTM A153/A153M-09 and ASTM A653/A653M-13 Class G185.
- .5 Fasteners and plates to meet the requirements of FM 4470-12 for wind uplift and corrosion resistance.
- .5 Flexible flashing membrane; high temperature grade for use at locations where membrane is not protected by insulation:
 - .1 Description:
 - .1 Thickness: 0.76 mm (30 mils) minimum.
 - .2 Self-adhesive grade rubberized membrane backed by high density polyethylene.
 - .3 Primer for substrate.
 - .4 High temperature grade to resist softening at 105°C (220°F) minimum.
 - .2 Acceptable *Products*:
 - .1 Henry 'Blueskin PE 200 HT'.
 - .2 Firestone 'Clad-Gard SA'.
 - .3 GCP Applied Technologies 'Ultra'.
 - .4 Soprema 'Lastobond Shield HT'.
- .6 Flexible flashing membrane; standard temperature grade for use at locations where membrane is protected by material with insulating properties:
 - .1 Description:
 - .1 Thickness: 1 mm (40 mils) minimum.
 - .2 Self-adhesive grade rubberized membrane backed by high density polyethylene.
 - .3 Primer for substrate.
 - .2 Acceptable *Products*:
 - .1 Henry 'Blueskin Roof RF200'.

Metal Flashing

- .2 GCP Applied Technologies 'Ice & Water Shield'.
- .3 Soprema 'Lastobond Shield'.

2.5 Fabrication

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable NRCA Roofing Manual: Membrane Roof Systems 2011, details and as indicated.
- .2 Fabricate metal flashings and other sheet metal work in accordance with applicable SMACNA "Architectural Sheet Metal Manual (Seventh Edition) details and as indicated.
- .3 Form pieces in 3048 mm (10 ft) maximum lengths. Make allowance for expansion at joints.
- .4 Sealed joints: Form non-expansion but movable joints in metal to accommodate sealant.
- .5 Expansion provisions: Form expansion joints of intermeshing hooked flanges, not less than 25.4 mm (1") deep, filled with butyl sealant concealed within joints.
 - .1 Joints that provide expansion and contraction capabilities should be located near the corners within approximately 610 mm (24") from each direction of the corner measured from the interior side.
- .6 Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, and of greater thickness of metal being secured.
- .7 Hem exposed edges on underside 12.7 mm (1/2"). Mitre and seal corners with butyl sealant.
- .8 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .9 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .10 Provide gap between drip edges and wall finish material to redirect water runoff away from walls as indicated.
- .11 Provide 25.4 mm (1") minimum overlap between bottom of wood blocking or flashing anchorage support and edge of drip or termination of flashing.
- .12 Shop fabricate inside and outside corners.

PART 3 - EXECUTION

3.1 Flexible Flashing Underlayment Installation

- .1 Apply primer to concrete masonry and precast concrete substrates.
- .2 Install in a consecutive weatherboard method starting at bottom or base of wall and working up.
- .3 Provide minimum of 50 mm (2") side laps and 75 mm (3") end laps.
- .4 Cut to manageable lengths, position membrane for alignment, remove protective poly-film and firmly apply pressure to assure adhesion.

Metal Flashing

- .5 Eliminate wrinkles or gaps, roll entire membrane surface (including seams) with a counter top or "J-roller" to ensure full contact and adhesion.
- .6 Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the air barrier membrane and around the perimeter edge of membrane terminations.
- .7 Flashing membrane shall be applied in weatherboard fashion starting at bottom of base of wall and working up, in and around the full perimeter of openings, to provide water tight protection and according to the following procedures:
 - .1 Apply the first strip horizontally immediately below the sill, cut it sufficiently long to extend past each side of the window, so that it projects even with the vertical jamb flashing to be applied later. Turn sill flashing up 50 mm (2") at ends of sill.
 - .2 Sill flashing shall overlap wall membrane. Overlap jamb at head flashing membrane in the same manner.

3.2 Roof Flashing Installation

- .1 Install sheet metal work in accordance with applicable NRCA Roofing Manual: Membrane Roof Systems 2011, details and as indicated.
- .2 Install sheet metal work in accordance with SMACNA Architectural Sheet Metal Manual - Seventh Edition - 2012.
- .3 *Provide* watertight flashing installing capable of resisting specified uplift pressures in accordance with roofing specifications, thermally induced movement and exposure to weather.
- .4 *Provide* minimum 10% slope for drainage towards roof at parapet locations, with minimum 2% sloped to drain at remaining flashing locations.
- .5 Provide continuous cleats for attachment of flashings at exterior face of wall and fasten at 150 mm (6") spacing and not less than 2 fasteners per cleat.
- .6 Provide radius (3-piece) copings for curved wall condition unless otherwise indicated.
- .7 Prefabricate corner copings in 610 mm (24") x 610 mm (24") shop fabricated and connected one pieces sections.
- .8 Concealed fastenings and cleats, from view except where exposed flashings are accepted by *Consultant* prior to installation.
 - .1 Roof side fastening of copings shall be accomplished using either cleats or exposed colour matched screws with EDPM backed metal washers fastened through oversized holes in coping to allow for thermally induced movement and spaced at maximum spacing of 610 mm (24") centre to centre and not less than 2 fasteners per section of coping.
- .9 Flash joints using S-lock forming tight fit over hook strips/cleats; unless otherwise indicated.
- .10 Install surface mounted flared joint true and level, and caulk top of reglet with sealant at reglets.
- .11 Insert metal flashings to other materials and flashings to form weather-tight junction.

Metal Flashing

- .12 Provide prefinished metal flashing over equipment curbs which are covered with roofing membrane.
- .13 Turn top edge of flashing into recessed reglet or mortar joint where indicated, to minimum depth of 25 mm (1"). Wedge flashing securely into joint. Seal flashing at reglet and cap flashing with sealant.
- .14 Expansion provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 3048 mm (10 ft) and provide uniform joint spacing with no joints allowed within 610 mm (24") of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 25.4 mm (1") deep, filled with butyl sealant concealed within joints.
- .15 Install flexible flashing membrane in accordance with manufacturer's written installation requirements.

3.3 Roof Drainage System Installation

- .1 General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- .2 Scuppers for parapets: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and tie into roofing membrane.

3.4 Installation of Roof Accessories

- .1 Incorporate devices to which roofing and flashing may be secured.
- .2 Install work to ensure that roofing and flashings will be properly applied to maintain building envelope weather-tight.

3.5 Installation Tolerances

- .1 Shim and align sheet metal flashing and trim within installed tolerance of 6 mm in 6 m (1/4 inch in 20 feet) on slope and location lines as indicated and within 3.2 mm (1/8") offset of adjoining faces and of alignment of matching profiles.

3.6 Adjusting and Cleaning

- .1 Remove deposits, stains or protections and wash metals left unpainted and exposed to view as recommended by manufacturer of metal or paint finish.

3.7 Protection

- .1 Advise *Contractor* of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering.

END OF SECTION

Roof Accessories

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Roof accessories.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit shop drawings showing layout, profiles, methods of joining, and anchorage details.

1.3 Delivery, Storage, and Handling

- .1 Package and brace *Products* to prevent damage in shipment and handling. Protect finish surfaces by sturdy wrappings, or covering.

PART 2 - PRODUCTS

2.1 Materials

- .1 RL3; Roof railing system:
 - .1 Non-penetrating galvanized steel guardrail.
 - .2 Basis of design:
 - .1 Skyline '5001 RoofBarrier Series'.
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Installation

- .1 Install work to meet requirements of manufacturer's written installation requirements.
- .2 Supply handling instructions, anchorage information, roughing-in dimensions, and templates for installation of work of this section, and assist or supervise, or both, setting of anchorage devices and construction of work of other sections incorporated with roof accessories.
- .3 Incorporate devices to which roofing and flashing may be secured, and, install work to ensure that roofing and flashings will be properly applied to maintain weather-tight building.

Roof Accessories

- .4 Verify under work of this section that installed products function properly and components fit in a weather-tight fashion.

3.2 Adjusting and Cleaning

- .1 Remove installer's equipment and debris as work progresses, and at completion of the work of this section in accordance with Section 01 77 00 and Section 01 74 13.
- .2 Remove markings from finished surfaces.
- .3 Repair or replace defaced or disfigured finishes caused as a result of the work of this section.

END OF SECTION

Sprayed Fire-Resistive Materials (SFRM)

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Sprayed fire-resistive materials.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 ULC or cUL design number, brand names and descriptive catalogue data of *Products* to be used in the work of this section.
 - .2 Include complete test report in cases where references are not published by testing laboratories, and where authority having jurisdiction has approved significant changes from tested assembly on basis of an engineering study; study calculations shall accompany report.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Materials and applied systems shall have full acceptance by authority having jurisdiction.

1.5 Delivery, Storage, and Handling

- .1 Store fireproofing materials in weathertight enclosure raised clear of the ground so they are protected from moisture.
- .2 Store materials in original undamaged sealed container with manufacturer's labels and seals intact to show the approval of Underwriters' Laboratories of Canada.
- .3 Discard any material which has come into contact with moisture prior to actual use.

Sprayed Fire-Resistive Materials (SFRM)

PART 2- PRODUCTS

2.1 Materials

- .1 Materials shall be listed in accordance with CAN/ULC S101-14 achieve required fire protection rating.
 - .1 At *Contractor's* option, use either type of sprayed fire-resistive materials specified, but use only one type throughout the *Work*.
- .2 *Products* shall be asbestos free.
- .3 Water, bonding agents, binders, accessories, cleaning solvents, aggregates and sealers shall be in accordance with base material manufacturer's recommendation.

2.2 Cementitious Fireproofing (Wet-Mix)

- .1 Description: Wet-mix spray-applied fire resistive materials (SFRM) consisting of factory mixed dry formulation of gypsum or Portland cement binders and lightweight mineral or synthetic aggregates mixed with water to form slurry for conveyance and application.
- .2 Acceptable *Products*; standard density:
 - .1 AD Fire Protection Systems 'Southwest Fireproofing Type 5GP'.
 - .2 GCP Applied Technologies 'Monokote MK-6'.
 - .3 Isolatek International 'Cafco 300'.
- .3 Acceptable *Products*; medium density:
 - .1 AD Fire Protection Systems Inc. 'Southwest Fireproofing Type 5MD'.
 - .2 GCP Applied Technologies 'Z-106 G'.
 - .3 Isolatek International 'Cafco 400'.

2.3 Mineral-Fibre Fireproofing (Dry-Mix)

- .1 Description: Dry-mix spray-applied fire resistive materials (SFRM) consisting of factory mixed dry formulation of Portland cement, inorganic binders combined with sprayed-applied mineral wool, conveyed in a dry state by pneumatic equipment and mixed with water at the nozzle, forming a slurry which is then applied to the substrate.
- .2 Acceptable *Products*; exposed but out of reach locations:
 - .1 Isolatek International 'Cafco Blaze-Shield DCF'.
 - .2 Isolatek International 'Cafco Blaze-Shield II'.

PART 3 - EXECUTION

3.1 Preparation

- .1 Review locations of exposed/non-exposed fireproofed surfaces with *Consultant* prior to application.
- .2 Prepare substrate in accordance with the written requirements of the manufacturer of the sprayed fireproofing material to achieve required fire protection.

Sprayed Fire-Resistive Materials (SFRM)

3.2 Application

- .1 Apply sprayed-applied fireproofing in accordance with the written requirements of the manufacturer of the sprayed fireproofing material, and as specified herein and in accordance with listed assembly.
- .2 Apply by the contour method in one or more coats of sufficient thickness to achieve the fire ratings as required.
- .3 Repair sprayed-applied fireproofing damaged by others after completion of the work of this section. Costs for damage shall be borne by the responsible party. Coordinate work with other sections.
- .4 Install the sprayed-applied fireproofing so that any movement of building structure acting alone or together does not tear, rupture, delaminate, puncture or perforate spray-applied fireproofing.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00, supplemented as follows:
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.
 - .2 Independent inspection and testing will be carried out on finished installation to verify, at random, densities and minimum thicknesses of sprayed fire resistant materials.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.4 Protection

- .1 Protect during installation any adjacent finished surfaces from contamination and damage due to the work under this section.
- .2 Protect completed work, vulnerable corners, edges, and surfaces liable to be damaged due to construction activities. *Provide* wood cover strips and sheet material as required to prevent damage.

END OF SECTION

Joint Firestopping and Smoke Seals

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Materials installed in joints to restrict the spread of fire and smoke.
 - .1 Joints in or between fire-resistance-rated constructions.
 - .2 Perimeter fire barrier systems between fire-rated floor/roof and non-rated exterior wall assembly.
 - .1 Coordinate perimeter fire barrier system installation requirements with work of curtain wall assemblies.
- .2 Section excludes:
 - .1 Firestopping and smoke seals, for mechanical, electrical and communications penetrations of fire resistant assemblies, and firestopping and smoke seals within their respective assemblies. Refer to Divisions 21, 22, and 23 and Divisions 26, 27, and 28.
 - .2 Seismic expansion joint assemblies is specified under Section 07 95 13.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordinate joint firestopping and smoke seal work with Section 01 33 00, paragraph 1.8 Project Firestopping Manual and Coordination.
 - .2 Coordinate with other sections to assure that pipes, conduit, cable, and other items that penetrate fire rated construction, have been permanently installed prior to installation of firestop assemblies.
 - .3 Schedule the *Work* to assure that penetrations and other construction that conceals penetrations are not erected prior to the installation of firestop and smoke seals.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Representatives for mechanical and electrical work and independent inspection and testing company shall attend pre-installation meeting.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets: Submit data and installation instructions for *Products* providing descriptions sufficient for identification at the *Place of the Work*.
 - .1 Materials list of *Products* proposed for use in the work of this section; complying with listed systems designs.

Joint Firestopping and Smoke Seals

- .2 Listing agency's detailed drawing showing joint assemblies and firestopping materials, identified with listing agency's name and number or designation, fire rating achieved, and date of listing.
- .3 Certificates:
 - .1 Submit the following certification documents with closeout submittals:
 - .1 Manufacturer's certification: Submit manufacturer's certification that installed firestopping and smoke seal *Products* are suitable for the use indicated and comply with specified requirements.
 - .2 Installation certification: Installer shall submit certification that all joint firestopping system installations are completed and that installations comply with listed systems designs.
 - .4 Submit fire resistance rating test listings for firestopping and smoke seal systems.
- .3 Shop drawings:
 - .1 Submit drawings indicating fire resistance rated assembly number, required temperature, hose stream, and flame rating, material thicknesses, installation methods and materials of firestopping and smoke seals, primers, supports, damming materials as applicable, reinforcements, anchorages, fastenings and methods of installation for each condition to be encountered.
 - .2 Designate on shop drawings static and dynamic joint systems, relative positions, expansion and control joints in rated slabs and walls, and firestopping details.
 - .3 Engineered shop drawings; for engineering judgements:
 - .1 Where *Project* conditions require modification to an accredited third party testing agency's listed system design to address a particular firestopping condition that is not covered by a listed system, submit engineered shop drawings detailing the modifications to the listed system design as an engineering judgment or equivalent fire-resistance-rated assembly, for each *Project* location and condition.
 - .2 Submit the manufacturer's engineering judgment identification number and shop drawing details prepared by a professional engineer. The engineering judgment submittal shall include both *Project* name, *Project* location, and *Subcontractor's* name who will install firestop system as described in engineering judgement shop drawings.
 - .3 Provide complete details of specific application of listed system and its modifications upon which the engineered judgement is based upon.
 - .4 For perimeter fire barrier systems:
 - .1 Submit engineered shop drawings for engineering judgements covering perimeter fire barrier systems. Identify each cladding assembly type in contact with each perimeter fire barrier system.
 - .4 Manufacturers' instructions:

Joint Firestopping and Smoke Seals

- .1 Manufacturer of *Products* proposed for use in work of this section shall prepare firestopping manual scheduling products to be used for each assembly and installation required in the *Work*.
 - .1 Coordinate with project firestopping manual specified under Section 01 33 00.
- .2 Manual shall include manufacturer's *Product* data sheets as specified under paragraph 1.3.2.
- .3 Firestopping manual shall be submitted within 4 weeks of *Contract* award.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval, training and certification of *Product* manufacturers.
 - .1 Submit proof of manufacturer's installer certification for each installer of firestopping and smoke sealant systems.
 - .1 Manufacturer's willingness to sell its firestopping *Products* to the *Contractor* or to an installer engaged by the *Contractor* does not in itself confer qualification on the buyer.
 - .2 Applicator shall designate a single individual as *Project* foreperson who shall be present at the *Place of the Work* at all times throughout the work of this section when the work of this section is being performed.

1.5 Delivery Storage, and Handling

- .1 Deliver materials to *Place of the Work* in manufacturer's unopened containers, containing classification label, with labels intact and legible at time of use.
- .2 Store materials in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- .3 Do not use damaged or adulterated materials and materials exceeding their expiry date.

1.6 Field Conditions

- .1 Comply with manufacturer's requirements relative to temperature and humidity conditions, before, during and after installation.

PART 2 - PRODUCTS

2.1 Manufacturers

- .1 General: Manufacturers of firestopping and smoke seal system *Products* and installation specialists for the work of this section are limited to applicable assemblies as required for the *Work* and having listing mark on packaging.
- .2 Subject to compliance with requirements, provide products by one of the following:
 - .1 3M Canada Inc.

Joint Firestopping and Smoke Seals

- .2 Hilti Canada Corp.
- .3 NUCO Inc.
- .4 STI Firestop.
- .5 Tremco Commercial Sealants & Waterproofing.

2.2 Performance/Design Requirements

- .1 Firestop and smoke sealant systems shall consist of material, or combination of materials installed to retain integrity of fire-rated construction by effectively impeding spread of flame, smoke, and/or hot gasses through perimeter joint or gaps, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers.
- .2 Smoke sealants applied over firestopping materials or combination smoke seal/firestop seal material shall form air tight barriers to prevent passage of gas and smoke.
- .3 Fire-resistance rating of firestopping system shall be equivalent to rating of adjacent floor, wall or other fire separation assembly.
- .4 Firestopping system at fire rated assemblies with assembly STC rating requirements shall provide STC rating equal to STC rating of fire rated assembly.
- .5 Confirm locations of exposed/non-exposed firestopping/smoke seal surfaces with *Consultant* prior to application.
- .6 *Provide* movement capability at movement joints in accordance with design requirements for movement joint.
- .7 Head-of-wall joints; with dynamic designation:
 - .1 Joint assemblies shall permit vertical movement allowing wall to move independent of structure due to forces including, but not limited to, live loads, dead loads, thermal expansion/contraction, seismic movements, and wind sway. Such movement shall not damage the wall assembly or its fire protection components.
 - .1 Provide head-of-wall joints with dynamic designation.
 - .2 Seismic dynamic joints: Provide head-of-wall joints with dynamic designation to accommodate seismic movement. Seismic requirements in accordance with building code.
- .8 Regulatory requirements:
 - .1 Joint firestop systems shall be listed in accordance with CAN/ULC-S115-11 and shall achieve required fire resistance rating in accordance with building code.
 - .2 Proposed firestopping and smoke seal materials and methods shall conform to applicable governing codes having local jurisdiction.

2.3 Materials

- .1 Single source responsibility for firestopping and smoke seal materials:
 - .1 Obtain firestopping and smoke seal materials from single manufacturer for each different *Product* required.

Joint Firestopping and Smoke Seals

- .2 Manufacturer shall instruct applicator in procedures for each material.
- .2 Firestopping and smoke seal systems shall conform to the following:
 - .1 VOC content not to exceed 250 gm/litre minus water.
 - .2 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gasses in compliance with requirements of CAN/ULC-S115-11 and not to exceed opening sizes for which they are intended.
 - .3 *Provide* firestopping materials and systems with fire-resistance rating not less than the fire-resistance rating of applicable adjacent assembly.
 - .4 Listed in accordance with CAN/ULC-S115-11.
 - .5 Use only joint firestop systems that have been tested by an accredited third party testing agency for specific fire-rated construction conditions conforming to construction assembly type, joint type and fire-rating requirements for each separate instance.
 - .1 Where there is no specific third party tested and classified firestop system for a particular firestop configuration, submit engineered shop drawings.
 - .6 For joints in fire-separations, provide listed systems designs for the joint firestop and smoke seal systems as required by building code to maintain the integrity of the fire separations.
 - .7 *Products* shall be compatible with abutting dissimilar membranes, architectural coatings, finishes at floors, walls and ceilings. Check with requirements of *Contract Documents* and manufacturer of selected materials being installed.
- .3 Smoke sealants for overhead and vertical joints shall be non-sagging; sealants for floors shall be self-levelling.
- .4 Smoke seal sealant colour at exposed locations: Grey.
- .5 Joint firestopping and smoke seal for head-of-wall joints at metal decking:
 - .1 Firestopping: Trapezoidal shaped firestop thermal material shaped to match metal deck profile for head-of-wall joints at metal deck locations.
 - .2 Smoke sealant: Smoke seal firestop surfaces with listed smoke sealant by spraying, brushing, or troweling material in accordance with listed system design.

PART 3 - EXECUTION

3.1 Preparation

- .1 Examine sizes, anticipated movement and conditions to establish correct thickness and installation of back-up materials.
- .2 Prepare surfaces in accordance with manufacturer's written specifications and to requirements of listed system designs.

Joint Firestopping and Smoke Seals

3.2 Installation

- .1 Install joint firestopping and smoke seal systems in accordance with manufacturer's written requirements and in compliance with listed system designs. Products and installation requirements must comply with listed system designs.
- .2 For materials that will remain exposed after completing the *Work*, finish to achieve smooth, uniform surfaces. Tool or trowel exposed surfaces.
- .3 Notify *Consultant* when random completed installations are ready for review, as directed by *Consultant*, prior to concealing or enclosing firestopping and as applicable, smoke seals.
- .4 Protect materials from damage on surfaces subjected to traffic.

3.3 Identification and Documentation

- .1 Provide documentation for each joint firestop system application addressed. This documentation is to identify each joint location on the entire Project.
- .2 Provide labels by fire stopping manufacturer of suitable material for permanent field identification of through-penetration firestops.
 - .1 Labels shall identify the following:
 - .1 'CAUTION – FIRESTOP. DO NOT REENTER, PUNCTURE OR DESTROY UNLESS PREPARED TO RE-SEAL IMMEDIATELY WITH PROPER ULC LISTED FIRESTOP'.
 - .2 Person to contact and phone number in case of modification or new penetration of fire stop system.
 - .3 Company name.
 - .4 Product catalog number.
 - .5 F and FT rating.
 - .6 Through-penetration firestop system designation of applicable testing and inspecting agency.
 - .7 Date of installation.
 - .8 Through-penetration firestop system manufacturer's name.
 - .9 Installer's name.
 - .2 Field fabricated labels are not acceptable.
- .3 Documentation for installed joint firestop systems is to include:
 - .1 Sequential location number.
 - .2 Project name.
 - .3 Date of installation.
 - .4 Detailed description of joint firestop system location.
 - .5 Listed firestop system design number or engineered judgment number.

Joint Firestopping and Smoke Seals

- .6 Type of joint.
- .7 Width of joint.
- .8 Overall length of joint.
- .9 Number of sides addressed.
- .10 Hourly rating of firestop joint system to be achieved.
- .11 Installers name.

3.4 Field Quality Control

- .1 Conduct quality control to be in accordance with Section 01 45 00.
 - .1 Field tests and inspections:
 - .1 Examine completed firestop joint installations to ensure proper installation before concealing or enclosing areas. Keep areas of work accessible until inspections are completed.
 - .2 Inspection consultant to review installation of the work of this section and to perform random tests to verify its completion in accordance with the requirements of the *Contract Documents*.
 - .3 Give at least 48 hours notice before operations commence, and arrange for a pre-job conference with *Contractor*, installer, independent inspection and testing company, manufacturer, and *Consultant* present.
 - .4 Independent inspection and testing company shall examine installed firestopping in accordance with ASTM E2393-20a. Independent inspection and testing company shall examine firestopping and shall determine, in general, that firestopping has been installed in accordance with requirements of the *Contract Documents* and in compliance with each listed firestop system design.
 - .5 Representatives of the manufacturer(s) shall have access to the *Work*. *Contractor* shall provide assistance and facilities for such access in order that the manufacturer(s) representative(s) may properly perform its function.
 - .2 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

Joint Sealants

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Joint sealants – exterior building envelope locations.
 - .2 Joint sealants – interior locations.
- .2 Section excludes:
 - .1 Roofing system sealants.
 - .2 Tiling control joint sealants.
 - .3 Glazing system assembly sealants.
 - .4 Fluid-applied flooring sealants.
 - .5 Mechanical and electrical sealants.
 - .6 Acoustic sealants.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 The following items shall be addressed at the pre-installation meeting:
 - .1 Analysis of the work and weather conditions.
 - .2 Shape factor of the joint.
 - .3 Recommendations for priming joints.
 - .4 Inspection of surfaces and joints.
 - .5 Compatibility of materials.
 - .6 Backing materials.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
 - .2 Submit manufacturer's and *Product* name for each sealant which will be used in the *Work* prior to commencing the *Work*.
 - .3 For *Products* specified to comply with SWR Institute Sealant Validation Program, provide written confirmation from SWRI of *Product* compliance.
- .3 Samples:
 - .1 Submit "wet sample" sealant colour samples for each sealant *Product* and colour.

Joint Sealants

.4 Test and evaluation reports:

- .1 Test sealant in contact with samples of materials to be sealed to verify adhesion will be achieved and no staining of the material will result. Prepare sample joints at the *Place of the Work* of each type of sealant for each joint condition.

.1 Submit test results to *Consultant* prior to application of sealants.

- .2 Test sealant in contact with samples of porous materials to be sealed to ensure that no staining of the material will result in accordance with ASTM C1248-22.

.1 Submit test results to *Consultant* prior to application of sealants.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.

.1 Include manufacturer's warranties.

- .2 Maintenance instructions:

.1 Submit maintenance instructions for all items for incorporation into the operation and maintenance manuals.

1.5 Quality Assurance

- .1 Qualifications:

.1 *Subcontractor*:

.1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified.

.2 Installer to comply with quality assurance articles referenced in ASTM C1193-16 for installation of joint sealants.

1.6 Field Conditions

- .1 Conform to sealant manufacturer's specifications and recommendations.

- .2 Do not proceed with installation of joint sealants under the following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer, or are below 5° C (40° F).

.2 When joint substrates are wet.

.3 Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.4 Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

Joint Sealants

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Interior sealants shall have a VOC limit of 50 g/L maximum, unless otherwise specified, and comply with South Coast Air Quality Management District (SCAQMD) Rule 1168, Adhesive and Sealant Applications.
- .2 Joint sealants:
 - .1 Shall perform as air tight and water-tight joints.
 - .2 Defects shall include, but are not limited to:
 - .1 Staining from abutting materials or filler.
 - .2 Migrating, bleeding into, or staining abutting materials.
 - .3 Unsightly surface deformation.
 - .4 Excessive colour change, chalking, or dust pick-up.
 - .5 Failing adhesively or cohesively where maximum elongation is less than 25% of designed width of exposed joints.
 - .6 Hardening to more than 25% over specified hardness.

2.2 Sealants

- .1 General:
 - .1 Single source responsibility: Obtain joint sealant from a single manufacturer for each joint sealant type.
 - .2 Colours: Sealant colours shall match colours of adjacent materials, as selected and approved by *Consultant*.
 - .1 Colours: shall be selected from manufacturer's full range of colours.
 - .3 In accordance with ASTM C920-14 and other requirements indicated for each liquid-applied chemically curing sealant, including those referencing ASTM C920-14 classifications for type, grade, class, and uses.
 - .4 For sealants to be applied to porous substrates:
 - .1 Provide products that have undergone testing in accordance with ASTM C1248-22 and have not stained porous joint substrates indicated for *Work*.
 - .5 Sealant supplied shall not exude any material(s) which travel into adjacent materials, or travel onto surfaces of adjacent materials; causing damage, or attracting soiling, which becomes apparent during the service life of the building.
- .2 Exterior sealants; joints in vertical and overhead surfaces:
 - .1 Silicone sealant; high performance; 100% inorganic type:

Joint Sealants

- .1 Single-component, non-sag, low to medium modulus non-bleed, high-performance silicone joint sealant, in accordance with the following: ASTM C920-11, Type S, Grade NS, Class 50 or greater. SWR Institute Sealant Validation Program.
- .2 Provide low or medium modulus sealants as recommended by exterior wall cladding manufacturer.
- .3 Acceptable *Products*:
 - .1 Low modulus:
 - .1 DOWSIL '790'.
 - .2 Momentive 'SCS2700 Silpruf LM.
 - .3 Sika 'Sikasil WS-290'.
 - .4 Tremco, Inc. 'Spectrem 1'.
 - .2 Medium modulus:
 - .1 DOWSIL '795'.
 - .2 Momentive 'SCS 2000 Silpruf'.
 - .3 Sika 'Sikasil WS-295'.
 - .4 Tremco, Inc 'Spectrem 2'.
- .3 Exterior general sealants; horizontal trafficable joints:
 - .1 High performance sealants:
 - .1 Silicone low modulus pour grade traffic sealant in accordance with the following: ASTM C920-14, Type SL, Grade P, Class 25.
 - .2 Acceptable *Products*:
 - .1 DOWSIL '890-SL'.
 - .2 DOWSIL 'SL Parking Structure Sealant'.
 - .3 Sika 'Sikasil-728 SL'.
 - .4 Tremco, Inc. 'Spectrem 900SL'.
- .4 Interior general sealants:
 - .1 VOC limit: Maximum 50 g/L, unless otherwise indicated.
 - .2 Interior sealant; at joints with painted gypsum board, non-clinical, dry location: one-component paintable acrylic or polyurethane sealant, in accordance with ASTM C834-10; Type OP, Grade -18° C, zero VOC.
 - .1 Acceptable *Products*:
 - .1 Sika 'Sikaflex 1A'.
 - .2 Tremco, Inc. 'Tremflex 834'.

Joint Sealants

- .3 Interior sealant; gap filler: at movement paintable joints in vertical surfaces: One-component polyurethane sealant in accordance with the following: ASTM C920-14, Type M or S, Grade NS, Class 25.
 - .1 Acceptable *Products*:
 - .1 Master Builders Solutions Canada 'MasterSeal NP100'.
 - .2 Sika 'Sikaflex 15LM'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Interior sealant, mildew resistant one part silicone sealant in accordance with the following: ASTM C920-14, Type S, Grade NS, Class 25.
 - .1 Acceptable *Products*:
 - .1 DOWSIL '786'.
 - .2 Momentive 'Sanitary SCS1700 Sealant'.
 - .3 Sika 'Sikasil GP'.
 - .4 Tremco, Inc. 'Tremsil 200'.
- .5 Specialty sealants:
 - .1 EXPJT2; Preformed expanding foam sealant with silicone facing:
 - .1 General description:
 - .1 Preformed sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system. Expanding foam to be cellular foam impregnated with a water-based, non-drying, 100% acrylic dispersion. Seal shall combine factory-applied, low-modulus silicone and a backing of acrylic-impregnated expanding foam into a unified hybrid sealant system.
 - .2 Preformed factory fabricated transitions and terminations.
 - .3 Silicone external facing to be factory-applied to the foam while it is partially pre-compressed to a width greater than maximum joint extension and cured before final compression. When compressed to final supplied dimension, a bellow(s) to handle movement must be created in the silicone coating. Silicone coating to be available in a range of not less than 26 standard colours for coordination with adjacent building materials.
 - .1 Colour: as selected by *Consultant*.
 - .2 Joint movement performance, including tension and shear: +50%, -50% (100% total) of nominal material size.
 - .1 Acceptable *Products*:
 - .1 Emseal Joint Systems, Ltd. 'Seismic Colorseal/Colorseal'.
 - .2 Willseal 'Seismic'.
 - .3 Substitutions: in accordance with Section 01 25 00.

Joint Sealants

- .2 Pick resistant (tamper resistant) one part polyurethane security sealant for movement joints:
 - .1 Acceptable *Products*:
 - .1 Pecora 'DynaPoxy EP-1200'.
 - .2 Sika 'Sikadur 31 High –Mod Gel'.

2.3 Accessories

- .1 General: *Provide* joint sealants, primers, backings, and fillers that are compatible with one another and with joint substrates and other sealants or joint fillers specified and approved for applications indicated under joint sealant scheduled and under conditions of service and application as demonstrated by joint sealant manufacturer based on proven test results and field experience. When incompatible, inform *Consultant* and change to compatible type acceptable to *Consultant*.
- .2 Cylindrical sealant backings: *Provide* joint backings that meet ASTM C1330-02, Type O (open-cell polyurethane), or Type B (non-absorbent bi-cellular backing materials with surface skin), sized 25 percent or greater than joint opening with proper density to control sealant depth and profile. Follow joint sealant manufacturer's recommendations with backing selections for optimum joint sealant performance, in accordance with the following schedule:
 - .1 Use open cell foam with non-absorbing closed cell skin (Sof-Rod) for vertical joints; round shape for open joints and triangular shape for angular joints.
 - .2 Use closed cell foam for horizontal joints.
- .3 Bond-breaker tape: Polyethylene tape or other approved plastic tape as recommended by joint sealant manufacturer to prevent 3-sided joint adhesion to rigid, inflexible joint fillers or joint surfaces at back of joint where such adhesion would restrict proper sealant movement or result in sealant failure.
- .4 Masking tape: Non-staining, non-absorbent and compatible with joint sealants and adjacent surfaces.
- .5 Sealant primers: Use primers only as recommended by sealant manufacturer where required to enhance adhesion of sealant to specific joint substrates indicated and as determined for use from pre-construction mock-up testing. Select primers in consultation with sealant manufacturer and manufacturer of substrate material which do not have a detrimental effect on sealant adhesion or in-service performance.
- .6 Cleaners for nonporous surfaces:
 - .1 *Provide* non-staining, chemical cleaners of type which are acceptable to manufacturer of sealant and sealant backing material, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
 - .2 *Provide* cleaner conditioner required for glass and glazed surfaces as recommended by sealant manufacturer.

Joint Sealants

PART 3 - EXECUTION

3.1 Manufacturer's Recommendations

- .1 Unless specified otherwise herein, comply with the recommendations and directions of the manufacturer whose materials are being used in the work of this section.

3.2 Preparation

- .1 Protect adjacent work areas and finished surfaces from damage during joint sealant installation.
- .2 Clean and prepare joint surfaces and substrates of substance that could impair the bond of joint sealants immediately before installing joint sealants.
- .3 Provide a dry, dust-free and cleaned substrate for optimum results.
- .4 Clean porous joint surfaces by using heavy-duty brushing, light abrasive, mechanical abrading or combination of these methods to produce a clean, sound surface for optimum bond with joint sealants per manufacturer's recommendations.
- .5 Clean non-porous surfaces using the two-cloth wipe method as referenced in ASTM C1193-16 and outlined by joint sealant manufacturer's written requirements.
- .6 Prepare rusting or scaling surfaces using abrasive cleaning methods as recommended by joint sealant manufacturer prior to joint sealant installation. Remove and neutralize efflorescence, mould, mildew and algae prior to joint sealant installation.
- .7 Prepare finish-coated surfaces per joint sealant manufacturer's specific recommendations.
- .8 Test materials for indications of staining or poor adhesion before any sealing is commenced. Submit reports in writing to *Consultant* of results.

3.3 Masking

- .1 Where necessary to prevent contamination or marring surfaces of adjacent materials, mask areas adjacent to joints with masking tape prior to priming or sealing application. Remove tape immediately after joint has been completed and an initial set achieved.

3.4 Installation

- .1 Install in accordance with joint sealant manufacturer's installation written requirements for products, primers and applications indicated unless more stringent project-specific instructions or requirements apply.
- .2 Apply joint sealants for continuous waterproof sealant joint protection. Lap vertical joints over horizontal joints as recommended by sealant manufacturer. Comply with installation recommendations in ASTM C1193-16 for use of joint sealants as applicable to each specific sealant installation.

Joint Sealants

- .3 Install sealant primers only when recommended by sealant manufacturer and demonstrated at pre-construction tests after joint surface preparation has been completed and when surfaces are verified as clean and dry. Allow any primer installation to completely dry or cure prior to installation of backing or joint sealants. Primer is mandatory for gun applied sealants.
- .4 Install joint sealants using proven techniques that comply with the following and in proper sequence with installation of primers and backings.
 - .1 Using proper joint sealant dispensing equipment, place sealants by pushing sealant beads into opening to fully wet-out joint sealant substrates. Fill sealant joint opening to full and proper configuration.
 - .2 Provide uniform cross-sectional shapes and depths in relation to joint width for optimum sealant movement capability per joint sealant manufacturer's written requirements.
- .5 Joint sealant tooling is required for non-sag joint sealant installations. Immediately after placing fresh sealants and before skinning or curing begins, tool sealants using metal spatulas designed for this purpose in accordance with manufacturer's recommendations. Provide a smooth, uniform sealant finish, eliminating air pockets and ensuring good contact for optimum sealant adhesion within each side of the joint opening.
 - .1 Provide concave joint configuration as indicated per figure 5-A in ASTM C1193-16 unless otherwise indicated.
 - .2 Use tooling agents that are approved in writing by sealant manufacturer and that do not discolour sealants or adjacent surfaces.
 - .3 Remove excess sealant from surfaces adjacent to joint openings using metal spatula, promptly cleaning any sealant residue from adjacent finished surfaces. Remove masking after joint sealant is installed.
- .6 Allow single-component sealants to fully cure before adhesion testing is performed as recommended by joint sealant manufacturer.
- .7 Match approved sealant mock-up for colour, finish and overall aesthetics. Remove, refinish or re-install work not in compliance with the *Contract Documents*.
- .8 When surfaces of adjacent materials are to be painted, perform sealant work before these surfaces are painted.
- .9 Check form release agent used on concrete for compatibility with primer and sealant. If they are incompatible inform *Consultant* and change primer and sealant to compatible type, or clean concrete to sealant manufacturer's acceptance.
- .10 Install joint backing material, filler strips, gaskets, bond breakers and similar type material of comparable performance characteristics. Install bond breaker tape or packing over asphalt impregnated fibre board as recommended by sealant manufacturer.
- .11 Where joints are 12.7 mm (1/2") or deeper, insert backing material in continuous uniform compression with setback from finished face of adjoining materials equal to required depth of sealant (width/depth ratio) as specified herein.
- .12 On horizontal traffic surfaces, support joint filler against vertical movement which might result from traffic loads, including foot traffic.

Joint Sealants

- .13 Install bond breaker tape in bottom of joints in lieu of sealant backing where proper depth cannot be obtained when backing is installed.
- .14 Maintain correct sealant depth. Sealant depth shall be 1/2 the width of the joint, maximum depth shall be 12.7 mm (1/2"), minimum depth shall be 6 mm (1/4"). Comply with manufacturer's written recommendations.
- .15 Fillet bead sealant joints to be sized to provide proper contact area with substrates, in accordance with manufacturer's written recommendations.
- .16 Apply sealants using pressure-operated guns fitted with suitable nozzles in accordance with manufacturer's directions. Apply sealants in such manner as to ensure good adhesion to sides of joints and to completely fill voids in joints.
- .17 Apply sealants so that surfaces of joints are smooth, full bead, free from ridges, wrinkles, sags, air pockets and embedded impurities. Tool sealant surfaces to produce a smooth surface.
- .18 Install sealant with exterior face of sealant set back 10 mm (3/8") from face of adjacent materials at building movement joints, unless otherwise indicated.
- .19 Do not apply sealants to areas where installation of paints, coatings or flooring is in progress. Apply sealants after such work is complete and fully cured.

3.5 Exterior Sealant Schedule

- .1 Include in work of this section joint sealants in exterior assemblies to seal open joints in surfaces exposed to view, and to make building weather-tight, as indicated, and as otherwise specified, except where specified under the work of other sections.
- .2 Exterior sealant work is part of the work of this section. Install sealant to:
 - .1 Perimeters of exterior openings where frames/glazing meet exterior facade of building.
 - .2 Movement and control joints in exterior surfaces of insitu concrete and masonry.
 - .3 Exterior joints between masonry and insitu concrete.
 - .4 Exterior joints in horizontal wearing surfaces.
 - .5 Perimeters of louvres.
 - .6 Perimeters of mechanical and electrical penetrations including but not limited to outlets and electrical boxes.
 - .7 Foam sealant installation: Compression when expanded in joint shall be 25% of uncompressed thickness. Depth shall be in accordance with manufacturer's sizing table. Touch-up joints with material matching foam sealant finish sealant.

3.6 Interior Sealant Schedule

- .1 Include in work of this section sealants to seal open joints in surfaces exposed to view, and to make building weather-tight and air-tight, as applicable, as indicated, and as otherwise specified, except where specified under the work of other sections.
- .2 Install sealant to:

Joint Sealants

- .1 Movement and control joints on exposed insitu concrete walls.
- .2 Interior control and expansion joints in floor and wall surfaces.
- .3 Raked out joints at junctions of masonry with concrete walls and columns, and at intersection of masonry walls and partitions where joint reinforcement is installed.
- .4 Perimeters of exterior and interior door and window frames.
- .5 Joints at tops of non-load bearing masonry walls at the underside of insitu concrete.
- .6 Exposed interior control joints in gypsum board.
- .7 Millwork junctions with walls.
- .3 Mildew resistant sealant at wet areas:
 - .1 Perimeter joints of wet fixtures such as:
 - .1 Urinals.
 - .2 Water closets.
 - .3 Janitor sinks.
 - .4 Showers.
 - .2 Wall tile joints, tile to tile at bathtub or shower corners. Gap between tile backer board and edge of bathtub or shower base.
 - .3 Counter/wall junctions at countertops.
- .4 Pick resistant security sealant:
 - .1 Level 1 SSAU, except staff room and washroom, group room and offices.
 - .2 Level 3 washrooms.

3.7 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Manufacturer's field review to be in accordance with Section 01 45 00.
 - .2 Provide manufacturer's field service consisting of periodic site visits by manufacturer or their distributor representative for observation of joint sealant application.

3.8 Adjusting and Cleaning

- .1 Remove droppings and clean off excess sealant or sealant residue adjacent to sealant joint installations as the work progresses by methods approved by joint sealant manufacturer before material achieves initial set.
- .2 Do not damage adjacent surfaces with harmful removal techniques and protect finished surfaces beyond those that have been masked.
- .3 Remove and replace damaged joint sealants.

Joint Sealants

- .4 Remove temporary coverings and masking protection from adjacent work areas upon completion.

3.9 Protection

- .1 Protect installed sealants during and after final curing from damage resulting during construction.

END OF SECTION

Expansion Joint Cover Assemblies

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Floor expansion joint cover assemblies.
 - .2 Wall/ceiling expansion joint cover assemblies.
 - .3 Exterior wall and soffit expansion joint covers:

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Include large-scale details of members and materials, of anchorage devices where required, dimensions, thicknesses, description of materials, metal finishing specifications and all other pertinent information.
 - .3 Submit plans indicating intermediate joint/splice locations and transition locations.
 - .4 Submit typical fire barrier cross-section(s) indicating pertinent dimensioning, general construction, and relationship to expansion control joint system.
- .4 Samples:
 - .1 Submit 305 mm (12") long sample of each type of fire barrier and expansion joint assembly. Include 1 expansion joint formed corner, and 1 typical butt joint, including fire barrier system.
- .5 Certificates:
 - .1 Submit material test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint fire barrier assemblies with requirements indicated.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Maintenance instructions:
 - .1 Submit maintenance instructions for all items for incorporation into the operation and maintenance manuals.

Expansion Joint Cover Assemblies

1.5 Quality Assurance

.1 Qualifications:

- .1 Installers / applicators / erectors: *Provide* the work of this section, executed by competent installers with minimum 5 years experience in the application of the *Products*, systems, and assemblies specified and with approval and training of *Product* manufacturers.

1.6 Delivery, Storage, and Handling

- .1 Protect from damage during shipping and installation. Remove damaged parts and at option of *Consultant*, return to factory for refinishing.

1.7 Field Conditions

- .1 Check actual locations of walls and other construction to which work must fit, by accurate field measurements before fabrication.
- .2 Show recorded measurements on final shop drawings and coordinate fabrication schedule with construction progress.

PART 2 - PRODUCTS

2.1 Manufacturer

- .1 Acceptable manufacturers:
 - .1 Construction Specialties.
 - .2 InPro Jointmaster Engineered Metal Products.
 - .3 Emseal Joint Systems Ltd.
 - .4 Tremco 'Willseal'.
 - .5 MM Systems.

2.2 Performance/Design Requirements

- .1 Joint movement:
 - .1 Design expansion joint covers to permit unrestricted lateral movement of up to plus or minus 50% of joint width. Expansion joints shall be designed and installed to maintain watertight joints.
- .2 Loading characteristics:
 - .1 Standard floor covers: Design to withstand a minimum load of 227 kg (500 lb) without damage or permanent deformation.
 - .2 Heavy duty floor covers: Design to withstand a minimum load of 900 kg (1984 lb) without damage or permanent deformation.
 - .3 Extruded aluminum wall and ceiling joint covers: Design to withstand a minimum impact load of 22.5 m/oz (75 ft/lb) without damage or permanent deformation. Tested in accordance with applicable provisions of ASTM F476-14.

Expansion Joint Cover Assemblies

.3 Fire barrier expansion joint covers:

.1 Fire performance characteristics; for fire rated assemblies.

.1 *Provide* expansion joint cover assemblies with fire resistance and cycling capability has been determined per UL 2079-20. Fire rating not less than the rating of adjacent construction.

.2 Composite fibreglass interior wall and ceiling covers shall be UL Tested, classified and labelled reflecting a class I fire rating in accordance with UL 723-2018 (ASTM E84-22) test procedures.

.2 Fire barrier systems; movement cycling:

.1 Manufacturer's fire barrier assembly shall demonstrate ability to cycle in accordance with the following:

Movement Type	Nominal Cycling Rate (cpm)	Complete Number of Cycles
Seismic	30	100
Followed by Thermal	10	400
Total Cycles:		500

.2 Fire barrier shall be cycle tested full length, incorporating splice transitions. All cycling and observations shall have been witnessed and documented by an independent third party testing laboratory.

2.3 Acceptable Products

.1 Floor to floor and floor to wall expansion joint covers:

.1 Exposed metal: Aluminum with mill finish.

.2 Cover plate design: 50 mm gap, seismic movement.

.3 Load capacity: Heavy duty.

.4 Expansion joints required to have FRR in coordination with the adjacent assembly type.

.5 Basis of Design:

.1 InPro Architectural Products '808 Series Floor Expansion Joint Cover.

.2 Wall and ceiling expansion joint covers:

.1 Exposed metal: aluminum with mill finish.

.2 Seal: Santoprene, #232 White colour.

.3 Basis of design:

.1 Construction Specialties Model FWF.

.3 Exterior wall and soffit expansion joint covers:

.1 Widths: Various as indicated on Drawings.

Expansion Joint Cover Assemblies

- .2 Exposed finish: Silicone, colour as selected by Consultant.
- .3 Basis of design: Emseal Seismic Colorseal.

2.4 Fire Barrier Systems

- .1 Fire barrier system; floors:
 - .1 Factory assembled fire barrier system designed to provide the indicated fire resistance rating, prevent passage of smoke and accommodate dynamic movement without stress or degradation to its components, rated and certified in accordance with ASTM E1966-15, UL 2079-20, CAN/ULC-S115-11, and be labelled (WH, cUL, ULC).

2.5 Materials

- .1 Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapour seals and filler materials, drain tubes, adhesive and other accessories compatible with material in contact, as indicated or required for complete installation for the purpose intended.

2.6 Fabrication - Expansion Joints

- .1 Expansion joint assemblies shall be fabricated in maximum available lengths to minimize joints.

2.7 Fabrication - Fire Barrier Systems

- .1 Fire barrier blankets and attachment retainers shall be shop assembled and fabricated in minimum 3048 mm (10 ft) lengths.

PART 3 - EXECUTION

3.1 Examination

- .1 Prior to commencement of the work of this section, examine structure and substrates for tolerances in dimension and any condition affecting the work under this section. Inform *Consultant* in writing of unacceptable existing work and conditions.
- .2 Commencement of installation of work of this section shall be construed as acceptance of existing work and conditions and no other claims based on same will be entertained.

3.2 Installation - Expansion Joint Covers

- .1 Install expansion joint cover assemblies in accordance with manufacturer's written specifications.
- .2 Where fastenings or anchors have to be built in by other trades, supply same with necessary templates, instructions, and supervision to ensure satisfactory installation. Supply metal anchoring devices.
- .3 Provide manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapour seals filler materials, adhesive and other accessories compatible with material in contact, as indicated or required for complete installation for the work of this section.

Expansion Joint Cover Assemblies

- .4 Accurately set joints to be flush with finished materials. Set expansion joint on level bed of elastomeric grout. Shimming of expansion joints not acceptable.
- .5 Apply elastomeric grout around flanges and anchors as applicable.
- .6 Backpaint aluminum surfaces in contact with cement, concrete, masonry, or dissimilar metals with heavy coat of non-staining alkali resistant bituminous paint.

3.3 Installation - Fire Barrier Systems

- .1 Site verify width of openings to receive fire barrier systems conform with the requirements of the *Contract Documents* and the tested and listed fire barrier system.
- .2 Protect fire barrier components from damage during storage, installation and post installation activities including placement of expansion control system.
- .3 Install fire barrier system assemblies in accordance with manufacturer's written specifications.
- .4 *Provide* splice sealants, transitions and anchoring hardware required for a complete installation of work of this section.
- .5 Fire barrier assemblies shall be cut in the field for exact length and changes in direction.
- .6 Upon completing installation of fire barrier system, inspect splices to verify sealants have been applied in accordance with fire barrier system manufacturer's requirements.
- .7 Clean and remove any debris from fire barrier system prior to installation of expansion joint cover.

3.4 Field Quality Control

- .1 Manufacturer's field review to be in accordance with Section 01 45 00.

END OF SECTION

Steel Doors and Frames

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Hollow metal doors and panels (steel doors).
 - .2 Insulated metal doors (insulated steel doors).
 - .3 Metal frames (steel frames, transom frames).
 - .4 Metal frames (steel frames for screens, sidelights, window assemblies).

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Cooperate fully with finish hardware distributor's representative during preparation of shop drawings and execution of shop fabrication.
 - .2 Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Include details of each door and frame type, finish hardware types and locations, frame profiles, door and frame elevations, mitre details, fire protection rating, glazing preparation details and anchor details and locations.
 - .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and in door schedule.
 - .3 Electrified hardware requirements and preparations shall be clearly indicated on shop drawings.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers:
 - .1 *Provide* doors and frames manufactured by a firm specializing in the design and production of hollow metal steel doors and frames.
 - .2 Manufacturer shall be a member in good standing of the Canadian Steel Door Manufacturers Association (CSDMA).

Steel Doors and Frames

1.5 Delivery, Storage, and Handling

- .1 Inspect materials thoroughly upon receipt and report immediately discrepancies, deficiencies and damages, in writing, to *Supplier*.
- .2 Note damages incurred during shipment on carriers' bill of lading and report immediately, in writing, to *Supplier*.
- .3 Store materials properly on planks, out of water and covered to protect from damage from adverse weather conditions. Remove wet packaging immediately.
- .4 Remove wrappings or coverings from doors upon receipt at the *Place of the Work*, and store in a vertical position, spaced with blocking to permit air circulation between them.

PART 2 - PRODUCTS

2.1 Manufacturers

- .1 All Steel Doors 2000 Ltd.
- .2 Apex Industries Inc.
- .3 Artek Door (1985) Ltd.
- .4 Daybar Industries Ltd.
- .5 Fleming-Baron Door Products.
- .6 M.J. Daley Manufacturing Co. Ltd.
- .7 Trillium Steel Doors Limited.
- .8 Vision Hollow Metal Limited.

2.2 Performance/Design Requirements

- .1 Exterior insulated metal doors shall be tested to meet an operable U-value of 0.450.
- .2 Fire rating requirements:
 - .1 Fire rated labelled doors and frames: tested in accordance with CAN/ULC-S104-15 and listed by a nationally recognized agency having a factory inspection service and shall be constructed as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
 - .2 Install fire labelled steel door and frame products in accordance with NFPA 80-2013, except where indicated otherwise.
- .3 Doors and frames shall function as intended, including but not limited to:
 - .1 Be in true alignment.
 - .2 Operate and swing freely, smoothly, and easily.
 - .3 Remain stationary at any point.
 - .4 Close evenly and tightly against stops without binding.
 - .5 Latch positively when doors are closed with moderate force.

Steel Doors and Frames

2.3 Materials

.1 Steel:

- .1 Fabricated from tensioned levelled steel in accordance with ASTM A924/A924M-22a, galvanized in accordance with ASTM A653/A653M-13, Commercial Steel CS, Type B.
- .2 Steel shall be free of scale, pitting, coil breaks, surface blemishes, buckles, waves, and other defects.
- .3 Minimum sheet thickness; uncoated steel sheet: in accordance with Appendix 1 of ANSI/NAAMM HMMA 861-14 "Guide Specifications for Commercial Hollow Metal Doors and Frames".
- .4 Finish: Minimum Galvanneal coating designation ZF120 (A40).

.2 Door core materials:

- .1 Polyisocyanurate: Closed cell, faced board, thermal value in accordance with ASTM C1289-22.
- .2 Steel stiffeners: Continuous vertical formed steel sections, 0.813 mm (0.032") minimum thickness, spaced not more than 150 mm (6") apart, welded at 150 mm (6") on center maximum to each face sheet. Fill voids with 24 kg/m³ (1.5 pcf) density minimum fibreglass type material in accordance with ASTM C665-17 or CAN/ULC S702-14.

.3 Door frame materials:

- .1 Fibreglass batt, minimum density 24 kg/m³ (1.5 lbs/ft³) in accordance with ASTM C665-17 or CAN/ULC S702-14.

.4 Adhesives:

- .1 Heat resistant, single component, polyurethane reactive (water) hot melt, thermoset adhesive.
- .2 Rigid insulation cores: Heat resistant, epoxy resin based, low viscosity, contact cement.
- .3 Lock seam doors: fire resistant, resin reinforced polychloroprene, high viscosity sealant-adhesive.

.5 Primer: rust inhibitive for touch-up.

.6 Finishing hardware: in accordance with Section 08 71 00.

.7 Miscellaneous:

- .1 Door silencers: single stud rubber or neoprene type.
- .2 Exterior top caps: Rigid steel welded.
- .3 Channel glazing stops and glazing trim: formed channel of minimum 0.81 mm (0.032") (20 gauge) steel, 15.9 mm (5/8") high.

Steel Doors and Frames

2.4 Fabrication - General

- .1 Fabricate steel doors, frames, transoms, sidelights and borrowed lights as applicable, to the design and dimensions indicated. Take field measurements where coordination with adjoining work is necessary.
- .2 Fabricate steel doors and frames to be rigid, neat in appearance and free from defects, warp, wave or buckle with all corners square unless otherwise indicated.
- .3 Operating clearances:
 - .1 *Provide* clearance at floor with allowance made for indicated finish flooring materials.
 - .2 Clearances for Fire-Rated Doors: As required by NFPA 80-2013.
 - .3 Clearances for Non-Fire-Rated Doors: Not more than 3 mm (1/8") at jambs and heads, except not more than 6 mm (1/4") between pairs of doors. Not more than 19 mm (3/4") at bottom.
- .4 Drill and tap or reinforce for mortised or surface mounted hardware in accordance with accepted hardware schedule, ANSI A115, NFPA 80-2013, or manufacturers recommendations.
- .5 Countersink exposed fasteners unless otherwise shown. Use flat or oval head screws.
- .6 Reinforce components to resist stresses imposed by hardware in use.
- .7 Allow for anticipated expansion and contraction of frames and supports.
- .8 Fit elements at intersections and joints accurately together, in true planes, and plumb and level.
- .9 Weld continuously at joints exposed to view or at joints through which air or water could penetrate from the exterior of building to the interior.
- .10 Perform welding in accordance with CSA W59-18.
- .11 Mortise, reinforce, drill and tap to receive hardware and security devices using templates provided by respective *Supplier*.
- .12 Touch up finish damaged during fabrication.
- .13 Prepare doors or frames to receive seals where seals are indicated.
- .14 Attach labels to suit required fire-protection ratings.

2.5 Fabrication - Steel Doors and Panels

- .1 Fabricate steel doors and panels to a thickness of 45 mm (1-3/4"), unless indicated otherwise.
- .2 Fire rated transom panels:
 - .1 Panel shall be installed at labelling facility as part of frame assembly; frame label shall cover both frame and panel assembly.
- .3 Exterior and insulated doors and panels:
 - .1 Face sheets fabricated from 1.06 mm (0.042") (18 gauge) steel.

Steel Doors and Frames

- .2 Insulation core: Polyisocyanurate.
- .3 Longitudinal edges continuously welded the full height of the door, filled and ground smooth with no visible seams.
- .4 Heavy duty doors and panels; steel stiffened:
 - .1 Face sheets fabricated from:
 - .1 1.34 mm (0.053") (16 gauge) steel.
 - .2 Steel stiffened core.
 - .3 Longitudinal edges continuously welded the full height of the door, filled and ground smooth with no visible seams.
- .5 Interior and non-insulated doors and panels:
 - .1 Face sheets fabricated from 1.06 mm (0.042") (18 gauge) steel.
 - .2 Polystyrene core.
 - .3 Longitudinal edges continuously welded the full height of the door, filled and ground smooth with no visible seams.
- .6 Fabricate of composite metal face construction with each face formed from flush sheet steel without visible seams, free of scale, pitting, coil brakes, buckles and waves.
- .7 Formed edges shall be true and straight with minimum radius for the thickness of steel used.
- .8 Lock and hinge edges shall be bevelled 3 mm in 50 mm (1/8" in 2") unless hardware or door swing dictates otherwise.
- .9 Top and bottom of doors shall be provided with inverted, recessed, 1.34 mm (0.053") (16 gauge) steel end channels, welded to each face sheet at 50 mm (2") on centre maximum.
- .10 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.
- .11 Exterior doors shall be provided with factory installed flush steel top caps.
- .12 Blank, reinforce, drill and tap doors for mortised, templated hardware. Locate hardware to manufacturer's standard unless indicated otherwise.
- .13 Holes 12.7 mm (1/2") and larger shall be factory prepared.
- .14 Glazing:
 - .1 For glazing use vision frame light kits as specified above.
 - .2 Glazing trim and stops shall be accurately fitted (within 0.39 mm (0.015") tolerance), butted at corners, with removable glazing stops located on the 'push' side of the door.
- .15 Fabricate closing stiles of paired doors as indicated or scheduled.
- .16 Provide 2.36 mm (0.093") (12 gauge) 'flat' or 'Z' astragal at meeting stiles of pairs of doors for fire rating according to the manufacturers listing and as scheduled.

Steel Doors and Frames

- .17 Where indicated in schedule, prepare doors and panels for installation of fire-rated door grilles. If required to meet door grille manufacturer's rated design, provide reinforcement around door grille opening.

2.6 Fabrication - Steel Frames

- .1 General: Applicable to frames, transom panel frames, sidelights, and window assemblies.
- .2 Exterior frames:
 - .1 Fabricated from:
 - .1 1.34 mm (0.053") (16 gauge) steel.
 - .2 Supplied set-up and welded (SUW).
 - .3 Welds shall not cause thermal transfers between interior and exterior surfaces of the frame sections.
 - .4 Closed sections (mullions and center rails) factory insulated with fibreglass batts.
 - .5 Incorporate head drips of same gauge material as frame and plug weld at 150 mm (6") on centre, fill and sand smooth.
- .3 Interior and non-thermally broken frames; welded:
 - .1 Fabricated from:
 - .1 1.34 mm (0.053") (16 gauge) steel.
 - .2 1.70 mm (0.067") (14 gauge) steel for frames noted as heavy duty.
 - .2 Supplied set-up and welded (SUW).
- .4 Factory assembled frame product shall be square, free of defects, warps or buckles.
- .5 Set-up and welded corner joints (SUW):
 - .1 Profile welded—punch mitred, continuously welded on inside of the profile faces, rabbets, returns and soffit intersections, with exposed faces filled and ground to a smooth, uniform seamless surface, as defined in the CSDMA - "Recommended Specifications for Commercial Steel Door and Frame Products".
- .6 Set-up and welded joints at mullions, sills and center rails:
 - .1 Coped accurately, butted and tightly fitted.
 - .2 At intersecting flush profile faces, securely weld, fill and grind to flush, smooth, uniform, seamless surface.
 - .3 At intersecting recessed profile faces, securely weld to concealed reinforcements, with exposed hairline face seams.
 - .4 At other intersecting profile elements make exposed face seams to hairline tolerance.
- .7 Where required due to site access, when required for co-ordination or installation, or shipping limitations, frame product shall be fabricated in sections for splicing in the field.

Steel Doors and Frames

- .1 Field spliced jambs, heads and sills shall be provided with 1.34 mm (0.053") (16 gauge) steel splice plates securely welded into one section, extending 100 mm (4") minimum each side of splice joint.
- .2 Field splices at closed sections (mullions or center rails) shall be 1.34 mm (0.053") (16 gauge) steel splice angles securely welded to the abutting member. Face of splice angle shall extend 100 mm (4") minimum into closed sections when assembled.
- .3 Field splice joints shall be welded, filled and ground to present a smooth uniform surface by the installation company responsible for installation after assembly.
- .8 On factory assembled frame product, provide 2 temporary steel shipping bars welded to the base of the jambs or mullions to maintain alignment during shipping and handling. Remove shipping bars prior to anchoring of frames to floor.
- .9 Each door opening shall be prepared for single stud door silencers. Silencers shall be shipped loose for installation by installer, after finish painting.
 - .1 Single interior doors: 3 at strike jamb.
 - .2 Pair of interior doors: 2 at header.
 - .3 Weather-stripped doors: None required.
 - .4 Sound, light, or smoke sealed doors: None required.
 - .5 Transom panels: 2 at each jamb.
- .10 Prior to shipment, mark each frame with an identification number as shown on the approved submittal drawings.
- .11 Provide mullions and transom bars of closed construction type. For fixed condition, attach members to frame with butt-welded joints. For removable condition, attach members with removable mullion anchors.
- .12 Conceal fastenings unless otherwise indicated.
- .13 Anchor frames to floor by 1.34 mm (0.053") (16 gauge) thick angle clips, welded to frame and *Provide* with 2 holes for floor anchorage.
- .14 Grind welded corners to a flat plane, fill with metallic paste filler and sand to uniform smooth finish.
- .15 Protect strike and hinge reinforcements using guard boxes welded to frames at masonry construction.
- .16 Reinforce head of frames wider than 1220 mm (48").
- .17 Brace frame units to prevent distortion in shipment and protect finish.
- .18 Cut-off door stops (sanitary stops) where indicated, capped at 30°, terminating at the indicated height. Fully weld joints below cut-off door stop and grind flush with no visible seams or gaps.
- .19 Fire rated transom panels:
 - .1 Secure panel in frame opening with minimum 19 mm (3/4") wide by 16 mm (5/8") high removable glazing stops, screw fastened.

Steel Doors and Frames

2.7 Hardware Reinforcements and Preparations

- .1 Door and frame product shall be blanked, reinforced, drilled and tapped at the factory for fully templated mortise hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
- .2 Door and frame products shall be factory blanked and reinforced only for mortised hardware that is not fully templated.
- .3 Where surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware are required frame product shall be reinforced only, with drilling and tapping done by field installation.
- .4 Templated holes 12.7 mm (1/2") diameter and larger shall be factory prepared, except mounting and through bolt holes, which shall be by installation on site. Templated holes less than 12.7 mm (1/2") diameter shall be factory prepared only when required for the function of the device (for knobs, levers, cylinders, thumb or turn pieces) or when these holes over-lap function holes.
- .5 Hinge reinforcements shall be 3.12 mm (0.123") (10 gauge) steel minimum, high frequency type shall be provided.
- .6 Frames shall be prepared for 114 mm (4.5") standard weight hinges minimum unless otherwise indicated.
- .7 Doors and frames in excess of 2450 mm (96") rabbet height shall be prepared for 114 mm (4.5") heavy weight 4.6 mm (0.180") hinges minimum.
- .8 Lock, strike and flush bolt reinforcements shall be 1.34 mm (0.053") (16 gauge) steel minimum, with extruded tapped holes that provide equivalent number of threads as 2.36 mm (0.093") (12 gauge).
- .9 Reinforcements for surface mounted hardware, concealed closers and holders and flush bolts shall be 1.06 mm (0.042") (18 gauge) steel minimum.
- .10 Reinforcements are not required for surface applied hardware supplied with thru-bolts and spacers or sex-bolts.
- .11 Provide hardware mortises on perimeter frame members to be grouted in masonry or concrete partitions with 0.66 mm (0.026") (22 gauge) steel grout guards.
- .12 Electrified hardware:
 - .1 Where electrically or electronically operated hardware is specified on the schedules or details or the final approved schedule and templates provided by the hardware supplier, hardware enclosures and/or junction boxes, where indicated on the templates, shall be provided and inter-connected with CSA approved 12.7 mm (1/2") diameter conduit and connectors.
 - .2 Refer to electrical documents for general electrical rough-in details. At door locations indicated in electrical documents as requiring rough-in only of electrical (ie. where no electrically or electronically operated hardware is specified in the hardware schedule), provide enclosures, boxes, and conduit to permit future installation of devices without removal of grout, demounting of frames, or installation of exposed conduits.

Steel Doors and Frames

.3 Frames:

- .1 Frames with electrified devices shall include electrical connection boxes sized to accommodate devices specified in Section 08 71 00. At time of frame manufacture, electrical connection boxes shall be supplied by Divisions 26, 27, and 28 for installation into frame by work of this section.
- .2 Frame electrical connection boxes shall be positioned flush to edge of frame face return. Clearance shall be maintained to allow wall material to be consistently applied for length of frame member. Frame connection boxes shall be welded in place and positioned to allow necessary clearance for electrical trade to install conduit and connection components, with conduit layout in a manner that takes conduit up to ceiling in an uninterrupted configuration and to accommodate wire installation.

.4 Doors:

- .1 Doors with electrified devices shall be manufactured to include wire raceway in door panel to accommodate electrified devices, such as electric hinge, power transfer units, electrified locks, electrified door closures and electrified exit devices. Construction of raceways shall provide a continuous conduit or channel between entry and exit points to accommodate wire installation after door manufacture.
- .2 Doors with electrified locks may require extended space to accommodate plug-type connection components or wire collection space. Coordinate with work of Section 08 71 00 and obtain hardware templates for electrified hardware clearly indicated on reviewed shop drawings and prior to door manufacture.

2.8 Frame Anchorage

- .1 Frame products shall be provided with anchorage appropriate to floor, wall and frame construction.
- .2 Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb.
- .3 Frame products for installation in new masonry walls shall be provided with steel adjustable wall anchors of the T-strap, stirrup or wire, 1.34 mm (0.053") (16 gauge) minimum or 3.96 mm (0.156") diameter wire. Straps shall be not less than 50 mm (2") x 254 mm (10") in size, corrugated and/or perforated.
- .4 Frame products installed in steel stud and drywall partitions shall be provided with 0.81 mm (0.032") (20 gauge) steel snap-in or "Z" stud type anchors.
- .5 Jambs of frames in previously placed concrete, masonry or structural steel shall be punched and dimpled to accept machine bolt anchors, 6.4 mm (1/4") diameter, located not more than 150 mm (6") from the top and bottom of each jamb. Anchor preparations and guides shall also be located immediately above or below the intermediate hinge reinforcing and directly opposite on the strike jamb. Each preparation shall be provided with 1.34 mm (0.053") (16 gauge) anchor bolt guides.
- .6 Anchor bolts and expansion shell anchors for the above preparations shall be provided by the installation company.

Steel Doors and Frames

- .7 Where frame product is installed prior to construction of the adjacent wall, each jamb shall be provided with 1.34 mm (0.053") (16 gauge) steel floor anchors. Each anchor shall be provided with 2 holes for mounting to the floor and shall be securely welded to the inside of the jamb profile.
- .8 On sidelights or windows exceeding 3 m (9'-10") in width, installed in stud partitions, channel extensions shall be provided from the top of the frame assembly to the underside of the structure above. Extensions shall be fabricated from 2.36 mm (0.093") (12 gauge) steel formed channels, mounting angles and adjusting brackets, with mounting angles welded to the inside of frame head. Formed channels, adjusting brackets and fasteners shall be shipped loose. Channels shall be mechanically connected to mounting angles and adjusting brackets with supplied fasteners, on site, by contractor responsible for installation.

2.9 Sizes and Tolerances

- .1 Widths of door openings shall be measured from inside of frame jamb rabbet with a tolerance of ± 1.6 mm (± 0.063 ").
- .2 Heights of door openings shall be measured from the finished floor (exclusive of floor coverings) to the head rabbet of the frame with a tolerance of ± 1.2 mm (± 0.047 ").
- .3 Unless finishing hardware dictates otherwise, doors shall be sized so as to fit the above openings and allow a 3 mm (1/8") clearance at jambs and head. A clearance of 19 mm (3/4") between the bottom of the door and the finished floor (exclusive of floor coverings) shall be provided. Tolerances on door sizes shall be ± 1.2 mm (± 0.047 ").
- .4 Manufacturing tolerances on formed frame profiles shall be ± 0.8 mm (± 0.031 ") for faces, door stop heights and jamb depths. Tolerances for throat openings and door rabbets shall be ± 1.6 mm (± 0.063 ") and ± 0.4 mm (± 0.016 ") respectively. Hardware cut-out dimensions shall be as per template dimensions, ± 0.4 mm (± 0.015 ").

2.10 Hardware Locations

- .1 Hardware preparations in frame product shall be as noted below and locations on doors shall be adjusted for clearances specified in paragraph 2.9 of this section.
- .2 Top of upper hinge preparation for 114.3 mm (4.5") hinges shall be located 180 mm (7.5") down from head, transom mullion or panel as appropriate. The top of the bottom hinge preparation for 114.3 mm (4.5") hinges shall be located 310 mm (12.625") from finished floor as defined in paragraph 2.9 of this section. Intermediate hinge preparations shall be spaced equally between top and bottom cutouts.
- .3 Strike preparations for unit, integral, cylindrical and mortise locks and roller latches shall be centered 1033 mm (40-5/16") from finished floor. Strikes for deadlocks shall be centered at 1220 mm (48") from finished floor. Strikes for panic or fire exit hardware shall be located as per device manufacturer's templates.
- .4 Push and/or pulls on doors shall be centered 1070 mm (42") from finished floor.
- .5 Preparations not noted above shall be as per hardware manufacturer's templates.
- .6 Hardware preparation tolerances shall comply with the ANSI A115 standards.

Steel Doors and Frames

PART 3 - EXECUTION

3.1 Examination

- .1 *Provide* necessary grounds, bracing and strapping for fitting and adequate for securing of the work.
- .2 Cooperate with work of other sections to ensure fastenings set by others are provided and located, their work is installed to their specifications and that those responsible for back priming are notified in sufficient time for them to schedule work.

3.2 Installation - Steel Doors and Frames

- .1 Set frame product plumb, square, aligned, without twist at correct elevation in accordance with NAAMM-HMMA 840-1708 11 13.
- .2 Fire labelled product shall be installed in accordance with NFPA 80-2013.
- .3 Frame product installation tolerances:
 - .1 Plumbness tolerance, measured through a line from the intersecting corner of vertical members and the head to the floor, shall be ± 1.6 mm ($\pm 1/16"$).
 - .2 Squareness tolerance, measured through a line 90° from one jamb at the upper corner of the product, to the opposite jamb, shall be ± 1.6 mm ($\pm 1/16"$).
 - .3 Alignment tolerance, measured on jambs, through a horizontal line parallel to the plane of the wall, shall be ± 1.6 mm ($\pm 1/16"$).
 - .4 Twist tolerance, measured at face corners of jambs, on parallel lines perpendicular to the plane of the wall, shall be ± 1.6 mm ($\pm 1/16"$).
- .4 Brace frame product rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install temporary wood spreaders at mid-point of frame rabbet height to maintain frame widths. Remove wood spreaders after product has been built-in.
- .5 Provide vertical support at center of head for openings exceeding 1250 mm (48") in width.
- .6 Secure anchorages and connections to adjacent construction.
- .7 Adjust operable parts for correct clearances and function.
- .8 Steel surfaces shall be kept free of grout, tar or other bonding materials or sealers.
- .9 Remove grout or other bonding material from products immediately following installation.
- .10 *Provide* appropriate anchorage for floor and wall construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite the strike jamb. On each jamb, install 2 anchors for openings up to and including 1525 mm (60") high and install 1 anchor for each additional height of 760 mm (30") of height or fraction thereof, except as indicated below. Frames placed in previously placed concrete, masonry or structural steel shall be *Provided* with anchors located not more than 150 mm (6") from top and bottom of each jamb, and intermediate anchors at 660 mm (26") on centre maximum.

Steel Doors and Frames

- .11 Secure frames set in previously constructed concrete or masonry openings by countersunk expansion bolts at same centres as for adjustable Tee wall anchors. Reinforce frame at fastening location to prevent indentation of frame by fastening device.
- .12 Fill and grind smooth "punch and dimpled" frame installations.
- .13 Prior to site touch-up, exposed surfaces of galvaneal steel to be finished shall be cleaned to remove foreign matter. Refer to paint manufacturers recommendations for additional information and requirements of Section 09 91 00.
- .14 Touch-up exposed field welds shall be finished to present a smooth uniform surface and with a rust inhibitive primer.
- .15 Touch-up exposed surfaces that have been scratched or otherwise marred during shipment, installation, and handling shall be with a rust inhibitive primer.
- .16 Finish paint in accordance with Section 09 91 00.
- .17 Install door silencers.
- .18 Properly fasten units and secure in place with concealed fixings wherever possible. Include grounds and furring where required.
- .19 Make allowance for deflection to ensure structural loads are not transmitted to frames.
- .20 Adjust operable parts for correct clearances and function.

3.3 Installation - Finishing Hardware

- .1 Install finishing hardware in accordance with ANSI A115.1G-1994, manufacturers' templates and instructions, and Section 08 71 00.

3.4 Adjusting and Cleaning

- .1 Adjust doors to swing freely, smoothly and easily, to remain stationary at any point, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force.
- .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 *Supplier's* requirements.
- .3 Adjust doors equipped with closers to close doors firmly against anticipated wind and building air pressure, and to enable doors to be readily opened as suitable for function, location, and traffic.
- .4 Clean hardware after installation in accordance with *Supplier's* requirements.

END OF SECTION

Interior Aluminum Sliding Doors

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Interior aluminum sliding doors; SPD1: multiple panels, with specialty glazing. Manual/power operated with breakaway feature as schedule in Door Hardware Schedule.
- .2 Section excludes:
 - .1 Automatic sliding entrance doors; SPD2: in accordance with Section 08 42 29.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Cooperate fully with finish hardware distributor's representative during preparation of shop drawings and execution of shop fabrication.
 - .2 Coordinate installation of doors with installation of hardware specified in Section 08 71 00.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.
 - .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and in door schedule.
 - .3 Electrified hardware requirements and preparations shall be clearly indicated on shop drawings.
- .4 Samples:
 - .1 Submit For door units with factory-applied colour finishes.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Installer:
 - .1 Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.

Interior Aluminum Sliding Doors

- .2 Mock-up:
 - .1 Mock-up may be incorporated in the completed work upon acceptance of *Consultant*.

1.5 Delivery, Storage, and Handling

- .1 Inspect materials thoroughly upon receipt and report immediately discrepancies, deficiencies and damages, in writing, to *Supplier*.
- .2 Note damages incurred during shipment on carriers' bill of lading and report immediately, in writing, to *Supplier*.
- .3 Store materials properly on planks, out of water and covered to protect from damage from adverse weather conditions. Remove wet packaging immediately.
- .4 Remove wrappings or coverings from doors upon receipt at the *Place of the Work*, and store in a vertical position, spaced with blocking to permit air circulation between them.

PART 2 - PRODUCTS

2.1 General

- .1 Finish: Clear anodized aluminium finish.
- .2 Provide the following
 - .1 Transom, sidelight and screens in profile to match door.
 - .2 Seals on door systems.
 - .3 Bevelled glazing stops on door systems.
- .3 Glazing types as indicated in door schedule and Section 08 80 00.
 - .1 Integral blinds: system of blinds that are hermetically sealed within a double-glazed cavity for a completely dust-free and maintenance-free environment
 - .2 Size: As indicated in door schedule.
- .4 Room: 3290.
 - .1 Overall frame width: 3048 mm (120").
 - .2 Clear door opening width: Minimum 1520 mm (60").

2.2 Performance requirements

- .1 Door panels
 - .1 Factory sealed to comply with UL 1784 for airborne isolation rooms and at locations required.
 - .2 Manual override feature to be provided.
- .2 Privacy requirements:
 - .1 Integral blinds: in accordance with Section 08 80 00 – Glass and Glazing.
 - .2 Applied film in accordance with Section 08 87 00 – Applied Films.

Interior Aluminum Sliding Doors

2.3 Manufactured Units

- .1 Acceptable Manufacturers:
 - .1 Refer to Finish Hardware Schedule for acceptable products.

2.4 Four Panel Doors

- .1 Perimeter mounted sliding doors: Low profile header with track and face plate, jambs, sliding door panels and swing out sidelites.
 - .1 Features:
 - .1 Trackless.
 - .2 Positive latching
 - .3 Door Panels: 44 mm door thickness aluminum extrusions with narrow vertical stile and horizontal rails, minimum 6 mm glazing.
 - .4 Sliding panel: opened with 8 to 12 lbs of force.
 - .5 Swing panel: after flush bolt release, maximum 50 lbs applied to strike stile.
 - .6 Hardware: positive latch pulls, constant latching flush bolt, top pivots, bottom off-set pivots, off-set pivot base plate, guide pin, and guide pin track.
 - .7 Card reader capable as scheduled.
 - .8 Manual/Touchless Automatic: As scheduled.

2.5 Fabrication

- .1 Framing Members:
 - .1 Fabricate generally to dimensions and profiles indicated on Drawings and to meet specified requirements. Maintain sight lines indicated and clearances to other construction components.
 - .2 Reinforce members for attachment of hardware.
 - .3 Provide flush glazing.
 - .4 Provide glazing rebate of depth and width to accommodate specified glass in accordance with glass manufacturer's recommendations. Install glazing gaskets anchored to aluminum extrusions.
- .2 Assembly of Units:
 - .1 Join members generally by welding where specified, and otherwise where practicable, using materials recommended by manufacturers of metals being removal and replacement without special tools.
 - .2 Ensure that continuity of weatherstripping is maintained around openings.
 - .3 Install astragal with stainless steel backing at pivot hinge jambs.
- .3 Fabrication Tolerances:

Interior Aluminum Sliding Doors

- .1 Fabricate work to a tolerance of plus or minus 1.6 mm for vertical, horizontal, and diagonal dimensions of units under 1828 mm, and plus or minus 3 mm for dimensions greater than 1828 mm.
- .2 Fabricate mullions to ensure under specified loads a maximum deflection of 1/175 of mullion span or 28 mm, whichever is less.
- .3 Make allowance in work for long term creep deflection in structure.

PART 3 - EXECUTION

3.1 Examination

- .1 Take critical site dimensions to ensure that adjustments in fabrication or installation are provided for, that allowance is made for possible deflection of structure at heads, and that clearances to other constructions have been maintained.
- .2 Ensure that anchors and inserts, installed by others, are adequate to meet specified requirements, and make adaptations before installation.

3.2 Installation

- .1 General:
 - .1 Install work plumb, level, and in accordance with reviewed shop drawings, by qualified experienced workers and to conform to fabricator's instructions.
 - .2 Do not force units into place, nor superimpose on them loads for which they were not designed.
 - .3 Secure units by non-corrosive and inorganic anchorage materials.
 - .4 Conceal anchors, clips, blocking, and all other attachments.
 - .5 Install reinforcing and supporting members as specified or indicated as part of the work of this Section.
 - .6 Seal metal-to-metal joints between components included in the work of this Section to provide a weathertight assembly, and in accordance with sealant manufacturer's specifications.
 - .7 Fill voids between frames and rough openings, and in mullions with glass wool.
 - .8 Install bumpers and stops as recommended by manufacturer and as required for complete installations.
- .2 Sealant: Seal between frame members, sills, and thresholds, and adjacent construction as a part of the work of this Section and in accordance with Section 07 92 00 – Joint Sealants.
- .3 Glazing: Install glass units in doors and sidelights, as indicated on the Drawings, each light minimum 6 mm thick, as a part of work of this Section and in accordance with Section 08 80 00 – Glass and Glazing.

3.3 Adjusting

- .1 Adjust doors to operate smoothly and fit tightly when closed.

Interior Aluminum Sliding Doors

- .2 Adjust hardware to operate smoothly, with proper tension, and lubricate.
- .3 Ensure that gasketing does not cause binding to prevent closing and locking, and that it makes tight contact.

3.4 Cleaning

- .1 Remove deposits which affect appearance or operation of units.
- .2 Remove protective materials.
- .3 Clean glass and aluminum surfaces as recommended by manufacturer.
- .4 Clean and restore stained metal surfaces in accordance with manufacturer's recommendations. Replace if cleaning is impossible.

3.5 Protection

- .1 Protect prefinished surfaces of metal work with protective coatings or wrappings to remain in place until construction completion. Use materials recommended by finishers or manufacturers of metals to ensure that method is sufficiently protective, easily removed, and harmless to finish.
- .2 Remove protection from metal glazing surfaces before installation of glass.
- .3 Maintain protection from time of installation to final cleanup.

3.6 Closeout Activities

- .1 Demonstration and Training:
 - .1 Before acceptance of system, arrange for demonstration of assembly with authorized representatives of *Owner*, to be performed by competent representative of equipment manufacturer to assure proper function, operation and explanation. Give *Owner's* representative a minimum of 10 days advance notice in writing of demonstration date.
 - .2 Conduct comprehensive demonstration for *Owner's* staff on operation and care of assembly.
 - .3 Provide formal training and demonstration at *Place of the Work* to *Owner's* designated representatives in operation and maintenance of each door type. Include for video operation training manual.
 - .4 Provide demonstration and training in accordance with Section 01 79 00

END OF SECTION

Ambulance Garage Vehicle Doors

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 High speed rigid coiling metal emergency vehicle entrance doors: high speed fast operating metal curtain with a double horizontal array of vision panels at vision height.
 - .1 Include detailed design, manufacturer, supply, installation, inspection and testing of as described in these performance specifications and summarized in the following elements of the work.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .2 Clearly indicate materials, operating mechanisms, required clearances and electrical connections.
 - .3 Shop drawings shall indicate that product and installation has been engineered to meet windload design required by building code.
 - .4 Submit door manufacturer's wind load performance and required installation parts and data required to comply with structural requirements of the building code.
 - .5 Submit manufacturer's operational requirements and limitations for operating doors under high wind events.
 - .6 Submit manufacturer's acoustic isolation requirements.
- .4 Templates:
 - .1 Submit information and templates required for installation of work of this section.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit operation and maintenance data for incorporation into operations and maintenance manuals.

Ambulance Garage Vehicle Doors

- .2 Submit door manufacturers' recommended operation or procedures to follow when operation doors in a high wind event or restrictions for when a door cannot be used.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor:*
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

1.6 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.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Exterior overhead coiling door construction shall be designed to withstand seismic and windloads in accordance with building code requirements.
- .2 Design door assembly for climatic design data for location of work and to withstand wind loads in closed position of 1 kPa positive 0.6 kPa negative minimum, with operators to function against 0.4 kPa wind load. Maximum deflection under full design load without permanent deformation or damage to operation.
- .3 Design ambulance vehicle doors:
 - .1 Operational wind load performance: Include components to maximize operational wind speed performance.
 - .2 Motorized operation system for maximum durability and door speed capability:
 - .1 1 million cycle rating.
- .4 Door operation speeds (up and down):
 - .1 Ambulance garage doors:
 - .1 Closing speed: Minimum 610 mm per second.
 - .2 Opening speed: Minimum 1525 mm per second.

2.2 Ambulance Garage Vehicle Door

- .1 Acceptable *Product*:
 - .1 Rytec 'Spiral Door'.
 - .2 Substitutions: in accordance with Section 01 25 00.

Ambulance Garage Vehicle Doors

2.3 Materials

- .1 Metal curtain: Formed with 150 mm high double walled extruded aluminum panel slats and 3 rows of vision slats located at vision height, with reinforced hinge system and integral weather seal between slats, design to allow removal of individual slats without removal of the entire panel.
 - .1 Doors which require the use of a tensioning system for wind pressure resistance will not be permitted.
 - .2 Vision slats: 3 full width vision slats per door, clear polycarbonate sheet with protection coating, set in glazing channels.
 - .3 Side frames: Steel side frames with full height weather seal on both sides to tightly seal against door panel. 2.9 mm steel side frames with 2.0 mm gauge steel covers. Dual, full-height weatherseal to seal against both sides of the door panel. Lower portion of side column covers removable to allow service access without the need to remove the entire cover.
 - .4 Counterbalance: Counterbalance extension springs assist the motor in opening the door. Doors using torsion springs for counterbalance, springs located within a barrel for counterbalance or without any counterbalance system will not be permitted.
 - .5 Bottom bar: Extruded aluminum bottom bar with electric reversing edge that reverses the door upon contacting an object; standard of manufacturer.
 - .6 Factory finished, metal components:
 - .1 In accordance with AAMA 2603.
 - .2 Colour: to later selection by *Consultant* from manufacturer's standard range.
 - .3 Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- .2 Side Frame: Powder coated steel angles, shapes, plates, and similar items: in accordance with CAN/CSA-G40.20/G40.21-13, Grade 350W.
- .3 Weather stripping; full weather stripping package.
- .4 Controls, Operator, and Safety:
 - .1 General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, brake, control stations, control devices, and accessories required for proper operation.
 - .1 Motor with variable speed AC drive with soft acceleration and braking. Doors using a motor with clutch or pump will not be permitted.
 - .2 Doors will rollup with no metal-to-metal contact, ultra-quiet, low maintenance operation.
 - .3 Controller to be housed in UL Listed NEMA 4X-rated enclosure with factory set parameters.

Ambulance Garage Vehicle Doors

- .4 Parameter changes to be made from the face of the control box, no exposure to high voltage. Control panels that require opening of the control box and reaching inside to make parameter changes will not be accepted.
 - .5 Programmable upper and lower limits.
 - .6 Brake release on side column.
 - .7 Controls to include variable speed AC drive system capable of infinitely variable speed control in both directions.
 - .8 Programmable inputs and outputs to accommodate special control applications without the need for additional electrical components.
 - .9 Self-diagnostic scrolling two-line vacuum fluorescent display provides expanded informational messages for straightforward installation, control adjustments, and error reporting.
 - .10 Errors to have time and date stamp for reference.
 - .11 Door will use rotary absolute encoder to regulate door travel limits. Limits to be self-adjusting, without the use of tools, from floor level at the control panel. Doors using mechanical limits switches or doors that require tools to set the limits will not be accepted.
- .2 Safety devices; light curtain:
- .1 Minimum 6' high "Intelligent" Advance³ Light Curtain System mounted directly in-line with door panel.
 - .2 Maximum spacing between the individual beams of the light curtain shall not exceed 75 mm (3").
 - .3 System will be tested via continuous loop communication between emitter, receiver and controller and be capable of identifying system faults within 10 milliseconds. Light curtains only tested prior to each closing cycle or simple binary output type light curtains not permitted.
 - .4 Light curtain emitter and receiver will communicate directly with each other and with door controls via RS485 protocol.
 - .5 Light curtain system will be capable of distinguishing between individual beams obstructed directly below the leading edge of the moving door and those obstructed further away from the leading edge.
 - .6 Beams blocked within 380 mm (15") below the leading edge of the door to result in a hard reversal in the shortest time possible.
 - .7 Beams blocked further away than 380 mm (15") away from the leading edge of the door to result in a soft reversal to reduce wear on motor.
 - .8 Light curtain systems whose operating principle is based on assumption of door position not permitted.
 - .9 Full-width, electric reversing edge along bottom of door instantly stops and reverses door to its full open limit when coming into contact with an obstruction above floor line during downward travel.

Ambulance Garage Vehicle Doors

- .10 Doors not using a reversing edge for redundant doorway safety not permitted.
- .3 Safety devices; LED safety light system:
 - .1 914 mm high x 10 mm wide LED light strips mounted to door side columns at eye level.
 - .2 Amber coloured lights flash will indicate the door is about to close and red lights illuminate and remain steady to indicate the door is closing.
 - .3 Safety light system will be mounted at the door threshold at eye level for maximum visibility and safety.
- .4 Wireless bottom bar:
 - .1 Bottom bar will be completely wireless. Reversing edge signal will be carried to the door controller via radio frequency. Doors using coil cords or wired connections of any kind not permitted.
 - .2 Wireless system will provide control-reliable, two-way communication between the bottom bar and the door controls for safety. During door operation, time lapse of communication between bottom bar and door controls will not exceed 5 milliseconds.
 - .3 Estimated battery life of wireless system to be no less than 3 years. Control box to indicate the need for battery replacement before low power is detected.
 - .4 Wireless system to employ frequency-hopping technology to prevent “cross talk” and RFID interference.
 - .5 Wireless system firmware to be upgradeable for future updates/enhancements without requiring additional wiring or components.
- .5 Camera sensor:
 - .1 Basis of design:
 - .1 BEA ‘LZR-Widescan’.
 - .2 Substitutions: in accordance Section 01 25 00.

PART 3 - EXECUTION

3.1 Examination

- .1 Examine building structure, finishes and conditions at the *Place of the Work*.
- .2 Notify *Consultant* of any adverse conditions which could jeopardize system installation or system operation. Do not proceed until such conditions have been documented, assessed, rectified and approved for installation. Starting work indicates acceptance of conditions unless *Consultant* is notified otherwise in writing.

3.2 Installation - General

- .1 Comply with manufacturer’s written installation requirements and recommendations. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

Ambulance Garage Vehicle Doors

- .2 Install hangers, brackets, fastenings, door track, operating hardware and fittings, and other specified equipment as recommended by door manufacturer.
- .3 Secure guides to steel framing members, header box to side guides and the motor to header box.
- .4 Drill and tap door frames to receive hardware. Fasten door tracks and stops to door frame by means of machine bolts; welding will not be permitted.
- .5 Fit doors snugly to all edges of jambs and heads of frames. Doors shall operate smoothly and freely under all conditions of operation. Door shall sit in any position in door opening and shall not drift upward or downward.
- .6 Install and adjust weatherstripping.
- .7 Upon completion of installation of doors and operating equipment, lubricate moving parts prior to putting into operation. Supply oil to gear reduction units and grease sprockets, bearings, cables, link chains and door guides.

3.3 Electrical Wiring

- .1 Power shall be brought up to circuit breaker/disconnect switch adjacent to controller under Divisions 26, 27, and 28 and in conformance with requirements specified therein.
- .2 Wiring from motor to switches, controls, starters, safety devices and other items requiring power shall be carried out under this section.
- .3 Use EMT conduit for fixed wiring. Use purpose-made and approved type flexible cables or cords at applicable locations; adequately support so as not to impede access or foul moving parts of equipment.

3.4 Adjusting and Cleaning

- .1 Adjust work of this section to ensure free-running, tightly closing and properly counterbalanced operation. Ensure that installation is free from warp, twist or other distortion. Lubricate operating hardware.
- .2 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at site only if approved.
- .3 Clean work on completion of installation.

3.5 Closeout Activities

- .1 Demonstration:
 - .1 Provide system demonstration and training to *Owner's* maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, preventive maintenance and procedures for testing and resetting release devices.
- .2 Testing:
 - .1 Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

Ambulance Garage Vehicle Doors

END OF SECTION

Glass Partitions and Screens

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Full height interior glass partitions and necessary hardware and related trim.
 - .2 Glass screens with pass through window at millwork locations. Coordinate with work of Section 06 40 00.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Indicate seismic design, connections, and restraint.
 - .3 Shop drawings shall include, but not be limited to complete details illustrating construction of the various parts of the work of this section, metal and glass thicknesses, cutouts, methods of joining, details of field connections and anchorage, interfacing with other work, fastening and sealing materials and methods.
 - .4 Indicate required coordinate counter supports required by 06 40 00.
 - .5 Submit catalogue cuts of manufactured items.
 - .6 Design calculations:
 - .1 Submit under seal, calculations prepared by a qualified Professional Engineer responsible for the preparation of the shop drawings that clearly indicate the following:
 - .1 Design assumptions regarding loadings and seismic design, related to the building code.
 - .2 Which codes and/or standards calculations are based on.
 - .3 Materials proposed and their allowable shear and bending stresses.
 - .4 Analysis for dead, wind, snow and guard loads as required and movements caused by temperature changes, support deflections and building sway.

Glass Partitions and Screens

- .5 Analysis to include anchors, glazing members, structural joints, sealants and glass. Show section property computations for framing members and submit full sized drawings.
- .4 Samples:
 - .1 Unless otherwise indicated, submit 3 samples for each of the following:
 - .1 305 mm x 305 mm (12" x 12") sample of each glass type and finish including sample of finished exposed glass edge.
 - .2 150 mm x 150 mm (6" x 6") sample of each metal type and finish.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance instructions:
 - .1 Submit operation and maintenance data for cleaning and maintenance of glass partitions and screens.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:
 - .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with training of *Product* manufacturers.

PART 2- PRODUCTS

2.1 Manufacturer

- .1 Acceptable Manufacturers:
 - .1 CR Laurance.
 - .2 Inkan.
 - .3 Substitutions in accordance with Section 01 25 00.

2.2 Performance/Design Requirements

- .1 Design glass to CAN/CGSB 12.20-M89. Thicknesses indicated are minimum thickness required. Increase thicknesses as required to meet design requirements.
- .2 Comply with requirements of jurisdictional authorities and the building code.
- .3 Design system to receive, accommodate and interface with work of other sections as indicated or required.
- .4 Design connections for work of this section to building structure and to adjacent construction to take into account peculiarities as may be found in the *Work*.

Glass Partitions and Screens

- .5 Design glass partitions and their connections to building structure and adjacent construction to ensure no possibility of weakening, loosening or fracturing occurring due to vibrations from any source.
- .6 Design light gauge steel structural members in accordance with CAN/CSA S136-07.
- .7 Design to relevant requirements contained in Section 06 40 00.

2.3 Partition Systems

- .1 Full height interior partition system:
 - .1 *Acceptable Product:*
 - .1 C.R. Laurence 'Sidelite Rails Style 31'.
 - .1 Profile: Square.
 - .2 Height: 150 mm (6").
 - .3 Finish: Extruded aluminum rails.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Pass through screens at countertops:
 - .1 Finish: Satin anodized.
 - .2 *Acceptable Product:*
 - .1 CRL Satin Anodized 10' Mechanical Glazing Channel for 1/2, Model MGC12SA.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .3 Accessories:
 - .1 Communication system:
 - .1 Finish: Satin anodized.
 - .2 *Acceptable Product:*
 - .1 CRL Satin Anodized 115V AC Combination Counter-Top/Thru-Glass Two-Way Electronic Communicator, Model TTU7X.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.4 Materials

- .1 Exposed metal and hardware:
 - .1 Extruded aluminum shapes:
 - .1 Extruded aluminum 6063-T5 alloy to ANSI H35.1/H35.1M-2017 with a minimum yield of 138 MPa (20015 PSI), free from defects impairing appearance, strength and durability. Tracks susceptible to wear shall be extruded from aluminum 6061-T6 alloy to ANSI H35.1/H35.1M-2017.
 - .2 Finish:

Glass Partitions and Screens

- .1 Anodized to AAMA 611-14:
 - .2 Clear anodized to AA Designation AA-M12C21A31 or AA-M12C22A31 (Class II).
- .2 Bolts, screws and fasteners: Series 300 or 400 stainless steel, cadmium plated.
- .3 Setting blocks: Neoprene ASTM C542-05(2017), 80 to 90 Durometer A.
- .4 Butt glazing joint sealant:
 - .1 Medium-modulus, neutral-curing silicone sealant; complying with ASTM C920-11, Type S, Grade NS, Application G, Class 25.
 - .2 Colour: Clear unless otherwise noted.
 - .3 Acceptable *Products*:
 - .1 Dowsil '999-A'.
 - .2 Momentive 'SCS1200'.
 - .3 Pecora '860'.
 - .4 Tremco 'Proglaze'.
- .5 Glass retaining member seals: PVC or Neoprene, ASTM C542-05(2017), 70 to 90 Durometer A, Teflon coated, compressible, with corner joints under compression to assure vertical to horizontal neoprene pressure contact.
- .6 Glass: in accordance with Section 08 80 00.
 - .1 Type: Low iron tempered laminate glass with custom pattern interlayer.
 - .1 Custom pattern and colour: to later selection by *Consultant*.
 - .2 Tong marks are unacceptable.
 - .3 Exposed glass edges: bevelled and polished smooth.
 - .4 Glass thickness: as required to meet design requirements, and to at least thicknesses as indicated.
 - .1 Glass thickness, minimum: 12 mm (1/2").
- .7 Interior partitions and screens; top and bottom channels:
 - .1 Aluminum.

2.5 Fabrication

- .1 Fabricate sections to accommodate and interface with work of other sections by means of rabbets, interlocks, miscellaneous angles, trim and filler sections, as required.
- .2 Component fastenings, concealed throughout, adequate strength, stainless steel and fusion welds.
- .3 Jointing and intersections of metals shall be accurately cut, fitted to a tolerance of 0.076 mm (0.003") in true planes with adequate concealed fastenings.

Glass Partitions and Screens

- .4 Perform fitting and assembly of component parts in shop, insofar as practicable. Work of this section that cannot be permanently shop assembled shall be fitted, assembled, marked and dismantled to assure proper fitting in field. Identify shop assembled components on shop drawings for location and erection at *Place of the Work*.
- .5 Pre-drill glass panels to accept hardware and hangers to templates of hardware manufacturer.
- .6 Cleanly and smoothly finish exposed edges of materials including holes.
- .7 Polish glass edges.

PART 3 - EXECUTION

3.1 Examination

- .1 Make thorough examination of *Contract Documents*, check anchorage, structural deflections, interfacing with work of other sections and other factors influencing design and performance and be fully cognizant of requirements.
- .2 Notify *Contractor* if preparations are required to be made in the work of other sections for proper attachment, securing or executing of the work of this section.
- .3 Check structural elements and adjoining framing on which the work of this section is dependent, verify governing dimensions. Confirm conditions satisfactory before proceeding.

3.2 Installation

- .1 Allow for dimensional tolerances and deviation from true plane permissible in structural support frame. Erect plumb and true, and in correct relationship to the work of other sections.
- .2 Install components in accordance with reviewed shop drawings.
- .3 Insulate between dissimilar metals or between metal, and masonry or concrete with bituminous paint to prevent electrolytic action.
- .4 Upon completion of glazing, check units for squareness, alignment and smooth operation, adjust as required. Clean and polish glass and remove soiling from exposed metal.

3.3 Installation Tolerances

- .1 Maximum variations from plumb and level: 3 mm (1/8") deviation in 3000 mm (10'-0").

3.4 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

Glass Partitions and Screens

3.5 Adjusting and Cleaning

- .1 At completion of the work of this section, remove labels from glass and clean inner and outer faces of glass and exposed finished metal surfaces. Replace scratched or broken glass and make good any damaged materials.

END OF SECTION

Automatic Sliding Entrance Doors

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Automatic sliding entrance doors; SPD2.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Clearly indicate each type of frame and screen, extrusion profiles, method of assembly, section and hardware reinforcement and mounting plates, locations of exposed fasteners, finishes, glazing systems, glass type, accessories, line of air barrier and drainage path, and as required to completely represent the proposed door system.
 - .3 Indicate fastening system for anchorage of door frame to opening and structural design for each door type and size.
- .4 Samples:
 - .1 Submit samples of colour and finish prepared as specified on respective metal components.
 - .2 Identify samples as to treatment, thickness, alloy, framing composition, colour, manufacture, performance standard and portion of the work to which they apply.
 - .3 Fabrication shall not proceed without written acceptance of samples from *Consultant*.
- .5 Test and evaluation reports:
 - .1 Submit relevant test report prepared by accredited independent testing laboratory, showing compliance with the design criteria of this section.

1.4 Closeout Submittals

- .1 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for incorporation into the operation and maintenance manuals in accordance with Section 01 77 00.

Automatic Sliding Entrance Doors

1.5 Quality Assurance

.1 Qualifications:

.1 Installers / applicators / erectors:

.1 Execute work of this section only by company who has adequate plant, equipment, and skilled workers to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified during a period of at least the immediate past 5 years.

.2 Provide at least one trade specialist who shall be thoroughly trained and experienced in skills required, be completely familiar with referenced standards and requirements of this work, and personally direct installation performed under this section.

.1 Foreperson experience: Minimum 10 years experience as glazing mechanic.

.2 Typical glazing mechanic experience: Minimum 3 years experience as glazers.

.2 Mock-up:

.1 Install door mock-up in location as directed. Include foamed-in-place insulation, air barriers, and connections to structure, sills, and other related work.

1.6 Delivery, Storage, and Handling

.1 Brace and protect frame units to prevent distortion and damage in shipment and handling.

.2 *Provide* methods for lifting or hoisting units into place without causing damage.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

.1 Reinforce units to withstand handling stresses, temperature changes, the effect of shrinkage forces, wind loads, dead and live loads, and related elements.

.2 Design components to achieve sufficient freedom of movement of members to allow for thermal expansion and contraction within the range of air and surface temperatures as applicable to the location of the components without causing harmful buckling, opening of joints, distortion, undue stress on fasteners, breakage of sealants, or other detrimental effects.

.3 Make provision for drainage to the exterior.

.4 Design light gauge aluminum *Products* to CSA CAN3-S157-M83.

.5 Design and anchor work so that there will be no objectionable distortion or seriously stressed fastenings as the metal expands and contracts. Design and fabricate expansion joints to ensure that they will be, and remain, permanently watertight. Locate joints as shown on reviewed shop drawings. *Provide* necessary wind bracing as required.

.6 Design mullions for maximum deflection of L/175.

Automatic Sliding Entrance Doors

- .7 Design to drain to exterior face of the door assembly, any water entering at joints and any condensation occurring within the door assembly.

2.2 Materials

- .1 Framing: Extruded aluminum with PVC thermal break, Aluminum Association alloy AA6063-T5 alloy and temper, 3 mm (1/8") thick.
- .2 Glass: VGL2, in accordance with Glazing Schedule.
- .3 Glazing materials: Refer to Section 08 80 00.
- .4 Weatherstripping: durable, non-absorbing material resistant to deterioration by aging and weathering. Weather stripping to be provided for level 1 entry vestibule
- .5 Frame sealant: One component elastomeric chemical curing, compatible with insulated glass unit sealants, to ASTM C920-14.
- .6 Lockset: latch-lock device, with locking function operable only from interior. Meet forced entry resistance requirements of building code and design requirements specified in this section.
- .7 Fasteners; aluminum framing: Commercial Quality steel screws, zinc plated and case hardened.
- .8 Fasteners; concrete/masonry: Commercial Quality zinc plated steel concrete screws or bolts.
- .9 Dielectric separator (Isolation material): Non-staining alkali resistant, 10 mil PVC membrane type, electrolytic isolation factor of 1.0.
- .10 Foamed-in-place insulation: in accordance with Section 07 21 00.
- .11 Air seal sealant: in accordance with Section 07 27 00.
- .12 Sealing of joints perimeter frame joints: in accordance with Section 07 92 00.
- .13 Divisions 26, 27, and 28: in accordance with Electrical specifications.

2.3 Finishes

- .1 Exposed aluminum surfaces; where indicated: Mill finished aluminum.
- .2 Exposed aluminum surfaces; anodized to AAMA 611-20:
 - .1 Clear anodized to AA Designation AA-M12C21A41 or AA-M12C22A41 (Class I).

2.4 Door Units

- .1 Automatic sliding entrance doors shall include operator, header and track, jambs, sliding door panel(s), and sidelite(s).
- .2 Mounting: Within rough opening with sliding panels sliding along sidelite.
- .3 Door motion shall be single-slide as indicated on drawings.
- .4 Sliding glass door panels shall allow breakout to the full open position to provide instant egress at any point in the door's movement. To allow safe egress, automatic operation shall be discontinued when the panel is in the breakout mode.

Automatic Sliding Entrance Doors

.5 *Acceptable Product.*

- .1 Refer to Finish Hardware Schedule.
- .6 Header Case: Shall be 152 mm (6") wide by 203 mm (8") high extruded aluminum capable of supporting bi-parting all glass doors of 100 kg (220 pounds) per leaf over a span of 4270 mm (14'-0") with minimal deflection. It shall contain door operator and door mounting components. The header cover shall have a continuous self-locking hinge to open flush with the top of the header for service access.
- .7 Door hanger wheels: shall be 64 mm (2-1/2") diameter urethane wheels with precision steel lifetime lubricated ball bearing centre. The all glass door(s) shall be held on the track by 51 mm (2") diameter anti-riser wheels and supported by a factory adjusted cantilever support and pivot assembly. The assembly shall allow the sliding doors to swing outward for emergency egress without the need for a lower door pivot support. The door height shall have an adjustment of 3 mm (1/8") +/- as required by field conditions.
- .8 Make allowances for deflection of structure and temperature movement. Ensure that structural loads are not transmitted to aluminum work.
- .9 Fit intersecting members to flush, hairline, and weather tight joints and mechanically fasten together.
- .10 Conceal fastenings from view, unless otherwise indicated.
- .11 Fabricate items fitting to the building from measurements taken on the *Work* as verified from the *Work* as built. Full responsibility for the proper coordination of the different components of the cladding and doors rests with this section.
- .12 Fabricate and assemble work of this section by skilled glazing installers. Do forming operations prior to finishing.

2.5 Operator

- .1 Door operator and controller: shall be an electro-mechanical operator and a regulated controller. The operator components shall consist of a DC permanent magnet 1/8 hp motor, gear reduction drive, position encoder, and a microprocessor control box.
 - .1 Power supply: 120 VAC, 5 amps, minimum.
- .2 Microprocessor control box: Torque shall be factory set in accordance with ANSI/BHMA A156.10-2011. The control box and position encoder shall automatically set the opening and closing check positions, and the full open and full closed position of the door system.

2.6 Sensor System

- .1 12-24 V AC/DC \pm 10%, 6 W maximum.
- .2 Threshold sensor: Self-contained fully adjustable sensor system that works in conjunction with motion sensors. Simultaneously with the door opening signal, the sensor shall be energized. It shall emit a 762 mm (30") deep by 1830 mm (72") maximum wide elliptical shaped infrared presence zone centered on the doorway threshold line. The door shall close after the motion sensor and threshold sensor detect a clear surveillance field.

Automatic Sliding Entrance Doors

- .3 Motion sensors: Switchable between bidirectional and uni-directional k-band frequency to detect all motion, fast or slow, in both directions with a relay hold time of 2–30 seconds. The motion shall be mounted to the header 3050 mm (10') maximum above the finish floor. Using the adjustable antenna the detection pattern shall be semi-circular, approximately 2134 mm (7') wide by 1525 mm (5') deep for a wide zone and approximately 1830 mm (6') wide by 2440 mm (8') deep for a narrow zone. The location of the detection zone shall be adjustable from the face of the door (20° to 35° in increments of 3°). The unit shall operate between 0°C through 50°C in all environmental conditions.
- .4 Safety Search Circuitry: Shall be provided which will recycle the glass doors when an object is encountered during the closing cycle. The circuitry shall search for that object on the next closing cycle by reducing the door speed at the position the object was previously encountered, and will continue to close in check speed until the doors are fully closed, at which time the doors will reset to normal speed. If the obstruction is encountered again, the doors shall come to a full stop. The door shall remain stopped until the obstruction is removed and an operate signal is given, resetting the door to its normal speed.

2.7 Configuration

- .1 Refer to Finish Hardware Schedule.

PART 3 - EXECUTION

3.1 Examination

- .1 Take dimensions at the *Place of the Work* to ensure that adjustments in fabrication or installation are incorporated, that allowance is made for possible deflection of structure at heads and that clearance to other constructions have been maintained.
- .2 Ensure that anchors and inserts, installed by others are adequate to meet specified requirements.

3.2 Installation

- .1 Door system shall be installed by factory-trained installers in accordance with door system manufacturer's written recommendations and reviewed shop drawings.
- .2 Install work plumb, square, level, free from warp, twist and superimposed loads.
- .3 Set sill into three continuous beads of silicone sealant and seal as required to prevent water leakage.
- .4 Secure work in required position. Do not restrict thermal movement.
- .5 Install hardware in accordance with templates.
- .6 Adjust operable parts for correct function.
- .7 Install in accordance with CAN/CSA A440.4-07 and requirements of building code.
- .8 Fasten jambs at 450 mm (18") on centre maximum spacing with corrosion resistant anchors, and aluminum anchor plates as required.
- .9 Explosive actuated or powder actuated fasteners will not be permitted.

Automatic Sliding Entrance Doors

3.3 Electrical Wiring

- .1 Power shall be brought up to circuit breaker/disconnect switch adjacent to controller under Divisions 26, 27, and 28 and in conformance with requirements specified therein.
- .2 Wiring from motor to switches, controls, starters, safety devices and other items requiring power shall be carried out under work of this section in accordance with requirements of Divisions 26, 27, and 28.
- .3 Use EMT conduit for fixed wiring. Use purpose-made and approved type flexible cables or cords at applicable locations; adequately support so as not to impede access or foul moving parts of equipment.

3.4 Glazing

- .1 Glaze aluminum doors with specified glazing tapes, blocks, and spacer shims in accordance with Section 08 80 00.

3.5 Air Barrier Continuity

- .1 It is the responsibility of this section to give complete cooperation in providing and maintaining the continuity of air barrier seal to adjacent materials to which the windows and frames abut.

3.6 Sealant

- .1 Apply sealant between frame members, sills and adjacent construction as a part of the work of this section and in accordance with Section 07 92 00 - Sealants.

3.7 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.8 Closeout Activities

- .1 Demonstration and Training:
 - .1 Before acceptance of system, arrange for demonstration of system with authorized representatives of *Owner*, to be performed by competent representative of equipment manufacturer to assure proper function, operation and explanation. Give *Owner's* representative a minimum of 10 days advance notice in writing of demonstration date.
 - .2 Conduct comprehensive demonstration for *Owner's* staff on operation and care of system.
 - .3 Provide demonstration and training in accordance with Section 01 79 00

END OF SECTION

Aluminum Framed Glazing Systems

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Fixed aluminum windows.
 - .2 Aluminum entrances and storefronts.
 - .3 Glass and glazing in accordance with Section 08 80 00.
 - .4 Seal joints within the work of this section in accordance with Sections 07 27 00 and 07 92 00, except where specified otherwise and at abutting joints between this section and the work of other sections.
 - .5 Air barrier transitions and connections between air barriers of adjacent wall and roofing systems.
 - .6 Prefinished aluminum panel fabrications, including closures, sills, cap flashings at interface with roofing flashing.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19 and the following requirements:
 - .1 Review methods and procedures related to glazing systems including the following:
 - .1 Review flashings, special interface details and scheduling with adjacent material assemblies, penetrations, and conditions of other construction that will affect glazing systems.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Submit warranty specimen prior to commencement of shop drawings.
- .3 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .4 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .2 Indicate with plans, sections, elevations and sufficient full size details, components and methods of assembly, materials and their characteristics relative to their purpose, and other fabrication information including relationships to adjacent systems.

Aluminum Framed Glazing Systems

- .3 Identify and describe material types being supplied, wall thicknesses of extrusions, and shapes including connections and grades, dimensions and tolerances (minimum and maximum), attachments, reinforcing, anchorage and locations of fastenings, air barrier transitions to various adjacent building envelope air barrier materials, and provisions for thermal and structural movement between components of this section and adjacent materials.
- .4 Include description of materials, metal finishing specifications, and other pertinent information.
- .5 Design loads, typical reactions and support movement allowances, both vertical and horizontal, shall be placed on the shop drawings.
- .6 Shop drawings shall clearly indicate the specification of materials and, where applicable, indicate installation methods and coordination with other sections.
- .7 Shop drawings shall clearly indicate paths and methods of moisture egress (should this occur) and ventilation of framing and spandrel conditions.
- .5 Design calculations:
 - .1 Submit under seal, calculations prepared by the professional engineer responsible for the preparation of the shop drawings that clearly indicate the following:
 - .1 Design assumptions regarding loadings and seismic design, related to the building code.
 - .2 Codes and standards to which calculations are based upon.
 - .3 Materials proposed and their allowable shear and bending stresses.
 - .4 Maximum and minimum tolerances for proposed materials including anchors, holes and spacings.
 - .5 Testing data to confirm compliance with performance requirements for the work of this section.
 - .6 Analysis for dead, wind, snow and guard loads as required and movements caused by temperature changes, support deflections and building sway.
 - .7 Analysis to include anchors, glazing members, structural joints, sealants, glass. Show section property computations for framing members and submit full sized drawings.
 - .8 Analysis to include thermal performance.
- .6 Samples:
 - .1 Submit 450 mm (18") x 450 mm (18") size samples of types of glass and aluminum framing assemblies with specified finishes. Submit 450 mm (18") x 450 mm (18") size samples of types of spandrel assemblies. Submit 200 mm (8") long samples of typical component sections (head, jamb, sill, meeting rail, and the like), fully assembled, indicating glazing and weatherproof methods.
 - .2 Control samples:

Aluminum Framed Glazing Systems

- .1 Submit two 305 mm (12") square samples of aluminum having specified finish of the required colours. Submit samples as many times as required to obtain approval of the range.
- .2 Mark direction of metal grain and rolling and aluminum finish application on back of control samples.
- .7 Test and evaluation reports:
 - .1 Submit valid independent laboratory test reports of full-scale mock-up for the specific glazing systems required under the work of this section, including framing members, glazing units, anchorage, slab edge covers, and transitions to adjoining assemblies and materials to demonstrate compliance respecting specified air and water infiltration and environmental separation performance and specified performance requirements specified in this section.
 - .1 Test reports shall be recent and produced within the past 5 years.
 - .2 Work shall not be fabricated until laboratory test reports demonstrate compliance with requirements of the *Contract Documents*. Where independent laboratory test reports do not demonstrate compliance with the *Contract Documents* include the cost of necessary testing in the *Contract Price*.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Provide training to the *Owner* in the operation, maintenance, and cleaning of the aluminum framed glazing systems. Submit printed copies of maintenance instructions given to the *Owner*.
 - .2 Submit maintenance data for cleaning and maintenance for windows, curtain walls for incorporation into the operation and maintenance manuals.

1.5 Quality Assurance - General

- .1 Installers / applicators / erectors:
 - .1 The work of this section shall be performed by a *Subcontractor* who is regularly engaged in the engineering, manufacture, fabrication, assembly, glazing and installation of curtain wall glazing systems. *Subcontractor* shall demonstrate to the acceptance of the *Consultant*, that they have successfully performed on comparable projects over the previous 10 years.

1.6 Delivery, Storage, and Handling

- .1 Comply with AAMA CW-10-15 – Care and Handling of Architectural Aluminum from Shop to Site.
- .2 Store parts in a dry place and permit natural ventilation over their finished surfaces.
- .3 Store materials in locations protected from damage by other trades.

Aluminum Framed Glazing Systems

- .4 Under conditions of high humidity or cold temperatures, supply heating or forced air ventilation to prevent accumulation of surface moisture.
- .5 Mark components to show location on building and on drawings.
- .6 Protect finishes with strippable coating that will not mar, nor deface finish on removal, or a similar method designed to afford an equivalent amount of protection. Leave protected coating intact until damage risk is past or immediately prior to final cleaning.
- .7 Stacking should be done to prevent bending pressure or abrasion of finished surfaces.

1.7 Field Conditions

- .1 Comply with requirements of *Product* manufacturers.

PART 2 - PRODUCTS

2.1 Manufacturer

- .1 Manufacturers shall develop materials and *Products* of this and related sections to achieve design intent as indicated and specified.
- .2 Subject to compliance with requirements, provide products by one of the following manufacturers:
 - .1 Alumicor Limited.
 - .2 Kawneer Company Canada Limited.
 - .3 Oldcastle Building Envelope.
 - .4 Schüco.
 - .5 CRL U.S. Aluminum.

2.2 Glazing System Design - Specific Component Requirements

- .1 Glass design:
 - .1 Design glass in accordance with CAN/CGSB 12.20-M89 and Section 08 80 00.
 - .2 Insulating glass units in accordance with Section 08 80 00.
- .2 Aluminum windows:
 - .1 Fixed windows; acceptable *Product*:
 - .1 Alumicor 'RainBlade 1990'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Description:
 - .1 Thermally broken assemblies.
 - .2 Fasteners: concealed.
 - .3 Glazing pockets shall be vented, pressure equalized and drained to the exterior.

Aluminum Framed Glazing Systems

- .4 Elastomeric air seal gasket shall be installed around the full perimeter of glass and sealed at corners with silicone sealant. Air seal gasket must provide adhesion with silicone sealant.
- .3 Aluminum entrances and framing:
 - .1 Acceptable entrance framing products:
 - .1 Interior entrance framing; acceptable *Products*:
 - .1 Alumicor 'FlushGlaze 800'.
 - .2 CRL US Aluminum '450 Series'.
 - .3 Kawneer 'TRIFAB 450'.
 - .2 Exterior entrance framing; acceptable *Products*:
 - .1 Alumicor 'FlushGlaze BF 3400'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Description:
 - .1 Fasteners: concealed.
 - .2 Door framing connections: Reinforce mechanically-joined corners of doors by welding, spigotting, welding and spigotting or by one piece cast aluminum angle to produce sturdy door unit.
 - .3 Weather-stripping: Dense, bulb polymeric material, resilient and retains weathering ability under temperature extremes.
 - .4 Door hardware; hinges, closers, thresholds, push/pulls, locks, exit hardware, and as indicated: supplied by Section 08 71 00 for installation by this section.

2.3 Performance/Design Requirements - General

- .1 Unless specified otherwise, glazing systems shall be designed to the following standards and references:
 - .1 American Architectural Manufacturers Association (AAMA).
 - .2 GANA 'Glazing Manual'.
 - .3 GANA 'Sealant Manual'.
 - .4 IGMA 'North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use'.
- .2 Removal and replacement of broken lites of glass shall be possible without cutting metal or moving the main frame in relation to the anchors.
- .3 Design glazing system and framing to prevent thermal shock and edge pressure fracture damage to the glass.
- .4 Metal faces of flashings, caps, framing and sheet cladding shall be visually flat.
- .5 Accurately shape mullion and cover caps at intersecting joints to obtain hairline joints, just wide enough to permit thermal movements.

Aluminum Framed Glazing Systems

- .6 Anchor design:
 - .1 Design anchors of the framing members to the building support to accommodate movements specified herein and to allow for construction tolerances.
- .7 Noise:
 - .1 Design the *Work* so that movements specified herein are accommodated without any audible noise being generated. In general, noise is produced by metal to metal contacts, and/or stresses being built up by movements and suddenly being relieved when friction forces are overcome.
- .8 Conceal fasteners connecting and fixing the framing members.
- .9 Framing cavity shall be compartmentalized every 6000 mm (236") horizontally and at corners to prevent the movement of air, in accordance with standard rain screen design.
- .10 Framing cavity shall be compartmentalized at demarcation of interior and exterior building envelope spaces to prevent the movement of air, in accordance with rain screen design.
- .11 Presence of any of the following shall constitute failures including, but are not limited to:
 - .1 Structural failures including, but not limited to, excessive deflection.
 - .2 Noise or vibration created by wind and thermal and structural movements.
 - .3 Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - .4 Water penetration through fixed glazing and framing areas.
 - .5 Failure of operating components.
 - .6 Failed glass units.

2.4 Performance/Design Requirements - Structural

- .1 Design components to the relevant sections of the building code, using limit states design methods.
- .2 Design glass in accordance with CAN/CGSB 12.20-M89, except where greater requirements are specified. For the purposes of glass design, cladding design, seismic and wind loads shall be taken to have a minimum duration of 60 seconds.
- .3 Design of framing systems shall include necessary adjustments to wall thickness of mullions, mullion reinforcing or other necessary structural design to comply with the specified design requirements. Such design measures shall not relieve the *Contractor* of achieving other requirements.
- .4 Movement criteria: the *Work* shall be designed and constructed so as to allow for movements of the *Work* and/or supporting structure as follows:
 - .1 Expansion and contraction of component materials of the *Work* produced by an exterior surface temperature range of -35°C to +60°C.
 - .2 Structural and thermal movements of the reinforced concrete and structural steel as prepared by the *Consultant's* structural engineers.

Aluminum Framed Glazing Systems

- .3 The above movements to be accommodated without overstressing components in the *Work*, and without buckling, failure of weather seals, undue stress on glass, glass breakage, undue stress on structural elements, or other detrimental effects.
- .5 Design aluminum framing members in accordance with CAN/CSA-S157-05/S157.1-05.
- .6 Deflection limits:
 - .1 The deflection of framing member in direction normal to plane of glass when subjected to uniform load deflection test in accordance with ASTM E330/E330M-14(2021), under specified design loads, shall not exceed 1/175 of clear span clear spans up to 4110 mm (13'-6") and to 1/240 of clear span plus 6.4 mm (1/4") for spans greater than 4110 mm (13'-6") or an amount that restricts edge deflection of individual glazing lites to 19 mm (3/4"), whichever is less.
 - .2 In the plane of the wall, deflection of framing members shall not reduce the glass or panel bite below 75% of the design dimension and shall not reduce the glass or panel edge clearance below 25% of the design dimension or 3 mm (1/8") whichever is greater. Restrict dimensions further if required for assembly, fit of components or to accommodate movements specified herein.
 - .3 Deflection limits for sheet metal air/vapour barriers including backpans shall be L/240 or maximum 6.4 mm (1/4") whichever is less, under specified design loads.
 - .4 For the work of this section, air barrier components, including sealants and membranes shall not fail under design conditions. Failure shall include loss of adhesion, excessive deflection, movement or displacement beyond product limitations, materials placed under stress beyond manufacturers recommended range.
- .7 Glazing that extends to a dimension of less than 1070 mm (42") above the adjacent finished floor level which is greater than 600 mm (24") above the ground on the exterior or interior of the building, shall have the glass, mullions and connections be designed as a guard to the following:
 - .1 The building code requirements for guards.
 - .2 The building code requirements for glazing subject to human impact.
- .8 Design structural steel structural components and fasteners in accordance with CSA-S16-14.
- .9 The design of the structural action of glazing systems shall be "simply supported" and shall not induce bending moment or thrust reactions into the building.
- .10 Seismic design: Comply with requirements of the building code and authorities having jurisdiction.
- .11 Design systems to withstand own dead load, snow, ice and wind loads and combination thereof, as calculated in accordance with the building code, to maximum allowable deflection without permanent deformation.

Aluminum Framed Glazing Systems

- .12 Design systems to have a method of attachment to the structure that will take into account peculiarities at the *Place of the Work* so that there shall be no possibility of site and air vibrations or normal temperature movements of the building to loosen, weaken, or fracture the connection between building envelope assembly components and the structure or between the components themselves.
- .13 Assembly shall be secured in a manner that will keep stresses on sealant within the sealant manufacturer's recommended working range.
- .14 Uniform load: No principal member shall display undue effects or permanent set in the framing members in excess of 0.2% of their clear spans after being subjected to structural load test equal to 1.5 times the specified design load, when tested in accordance with ASTM E330/E330M-14(2021).

2.5 Performance/Design Requirements - Air Filtration and Water Resistance

- .1 Air infiltration/exfiltration rate:
 - .1 Fixed glazing: Maximum 0.1 L/s/m² (0.02 cfm/ft²) of glazing area when tested in accordance with ASTM E283-04 at test pressure of 300 Pa (6.27 psf).
- .2 Water resistance:
 - .1 Static; fixed and operable glazing: No water penetration shall occur when the work is tested in accordance with ASTM E331-00, amended to prohibit water from passing through interior glazing seals or frame joints, at a test pressure equal to 20% of positive design wind pressure and but not less than 300 Pa (6.27 psf).
- .3 Design glazing systems using rain screen principle with the following characteristics:
 - .1 Interior (room-side) air seal at component interfaces.
 - .2 Exterior (weather-side) deterrent seal formed by continuous gaskets or flush silicone seal as applicable.
 - .3 Glazing pockets vented and drained to the exterior.
 - .4 Extrusions with integral gutters of sufficient depth to carry intruded rainwater and snow-melt to the exterior.
 - .5 System of baffles to prevent water entering the glazing cavity due to gravity, capillary action or rain momentum.
 - .6 Metal to metal joints within the glazing cavity shall be designed and installed to be sealed prior to assembly and fixing and so as to provide continuous drainage of water to points of egress from assembly. Where location of drainage must drain more than one lite and/or spandrel, the number of drainage holes shall be increased according to rain screen design principle.
- .4 Cap and seal exposed ends of mullions and caps, while not compromising drainage qualities.

2.6 Performance/Design Requirements - Thermal

- .1 No condensation or frost shall form on the interior of glazing or framing members when tested under the following conditions:

Aluminum Framed Glazing Systems

- .1 Interior air: 22°C, 35% R.H.
- .2 Exterior air: -20°C, 24 km/h (15 mph) wind speed.
- .2 In addition to the above requirements the framing system shall be designed such that condensation or frost will not form on the interior surface of the aluminum members before appearing on the adjacent insulating glass units. To achieve this requirement, any metal on the exterior of the *Work* will require a thermal break between metal on the interior.
- .3 Brackets and attachment shall not cause thermal bridging resulting in interior condensation forming at design conditions.

2.7 Materials

- .1 Glass: in accordance with Sections 08 80 00.
- .2 Aluminum extrusions: Accurately formed, extruded aluminum alloy in accordance with ASTM B221-21: AA-6063-T5/T6, free from defects impairing appearance, strength and durability.
 - .1 Minimum thickness of 3 mm (0.125") for framing members, and 1.27 mm (0.050") for glazing stops, snap caps and similar components unless indicated otherwise.
- .3 Aluminum flashing:
 - .1 Minimum wall thickness: 0.812 mm (0.0320")(20 B&S gauge), unless otherwise indicated.
 - .2 Aluminum alloy:
 - .1 For painted finish, where indicated:
 - .1 In accordance with ASTM B209-14: AA3003-H14 Painting Quality.
 - .2 In accordance with ASTM B209-14: AA5052-H32 Painting Quality.
- .4 Shims: Utility grade aluminum sheet when not in contact with concrete; stainless steel when in contact with concrete or cementitious substances of thickness required, or galvanized steel.
- .5 Air barrier materials; transition from glazing system air barrier and tying into building envelope air barrier systems:
 - .1 Silicone sheet air barrier membrane and manufacturer's recommended sealants and accessories:
 - .1 Air barrier transition system to resist specified design loads when subjected to uniform load deflection test in accordance with ASTM E330/E330M-14(2021).
 - .2 Air barrier transition system to allow no water penetration in accordance with ASTM E331-00 to a design pressure not less than 720 Pa (15 psf).
 - .3 Acceptable *Products*:
 - .1 Tremco 'Proglaze ETA Engineered Transition Assembly'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .6 Fasteners:

Aluminum Framed Glazing Systems

- .1 Non-magnetic (austenitic) 300 series alloy stainless steel unless otherwise indicated.
- .2 Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
- .3 Provide nuts or washers of design having means to prevent disengagement; deforming of fastener threads is not acceptable.
- .4 Provide concealed fasteners unless indicated otherwise.
- .5 For exposed locations, provide countersunk flathead fasteners with finish matching item fastened.
- .7 Anchors: Three-way adjustable anchors with minimum adjustment that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - .1 Inserts and surface mounted supports: Hot-dip galvanized cast-iron, malleable-iron, or steel complying with ASTM A123/A123M-13 or ASTM A153/A153M-09 requirements.
- .8 Sheet metal backpans and air barriers: 0.91 mm (0.036") (20 gauge) thickness, galvanized sheet steel in accordance with ASTM A653/A653M-13, Designation G90/Z275.
 - .1 Fasteners: Corrosion resistant, zinc plated, covered and sealed to sheet metal with silicone sealant.
- .9 Dielectric separator: Non-staining alkali resistant, rubber isolation pads or 10 mil vinyl membrane type, electrolytic isolation factor of 1.0.
- .10 Internal sealant and air barrier sealant: One-part, neutral cure, high performance silicone sealant complying with ASTM C920-14, Type S, Grade NS, Class 25, capable of sustaining dynamic movements, SWRI sealant validated.
- .11 Insulation at spandrels, closures and flashings: in accordance with ASTM C612-14, Type IVA or IVB, non-combustible in accordance with CAN/ULC-S114-05.
 - .1 Acceptable *Products*:
 - .1 Johns Manville 'MinWool Curtainwall'.
 - .2 Rockwool 'CurtainRock'.
- .12 Insulation attachment:
 - .1 Galvanized stick-pins, welded to sheet metal backpans, located at maximum spacing of 300 mm (12") o/c and within 150 mm (6") from edge of insulation boards. Seal welds with 1 coat zinc-rich coating.
- .13 Zinc-rich coating: Touch-up paint for welded galvanized areas; 2 coats of zinc-rich paint in accordance with CAN/CGSB 1.171-98, VOC <340 g/L.
- .14 Thermal barrier component:
 - .1 Rigid polyvinyl chloride or neoprene or polyurethane providing full separation of interior and exterior components. Thickness shall be as required to meet design.

Aluminum Framed Glazing Systems

- .2 Glass fibre reinforced polyamide porthole extrusion providing full separation of interior and exterior components. Thickness shall be as required to meet design.
- .15 Miscellaneous steel: in accordance with CSA G40.21-13, Grade 300W.
 - .1 Finishes:
 - .1 Behind air/vapour barrier: CISC/CPMA 2-75 primer.
 - .2 Exterior to air/vapour barrier, and where condensation could occur: hot dip galvanized after fabrication or Type 300 series stainless steel.
- .16 Spacers for glazing sections receiving metal flashed, panels; behind pressure plate: High density polyethylene (HDPE) or PVC.
- .17 Foamed-in-place insulation: Refer to Section 07 21 00.

2.8 Finishes

- .1 Exposed aluminum surfaces: 70% Kynar 500 or Hylar 5000 fluoropolymer resin systems, ceramic pigments and other select inorganic pigments in accordance with AAMA 2605-20.
 - .1 Acceptable *Products*:
 - .1 PPG 'Duranar'.
 - .2 Colour: to match existing.
- .2 Finish exposed metal fasteners: baked-on finish to match related aluminum surfaces.
- .3 Finish steel clips and reinforcing steel with 610 g/m² zinc coating in accordance with ASTM A123/A123M-09.

2.9 Fabrication - General

- .1 Insofar as practical, execute fitting and assembly in the shop with the various parts or assemblies ready for erection at the *Place of the Work*.
- .2 Take field measurements and levels required to verify or supplement those shown for the proper layout and installation of the *Work*. Coordinate dimensional tolerances in adjacent building elements and confirm prior to the commencement of the work of this section. Commencement of installation floor by floor shall be construed as acceptance of building conditions. Glazing systems shall not deviate from tolerances specified.
- .3 Verify measurements at the *Place of the Work* and fabricate systems to suit dimensions at the *Place of the Work*.
- .4 Fabricate glazed framing to provide uniform rough opening dimension:
 - .1 Maximum tolerance will be +/- 3 mm (1/8") for rough opening joint width.
- .5 Conceal nuts, bolts, screws, clips and other means of fastening in finished *Work*, except where shown or specified otherwise.
- .6 Maintain dimensional tolerances from vertical and horizontal planes with the closest possible accuracy for the various parts as previously designated.

Aluminum Framed Glazing Systems

- .7 Means of anchoring systems shall have sufficient adjustment to permit correct and accurate alignment. After adjustment, positively lock anchorage devices in manner to preclude movement, once alignment is achieved.
- .8 Isolate aluminum bearing contact with dissimilar materials other than air/vapour seal. Method of isolation shall be to *Consultant's* acceptance.
- .9 Make allowances for deflection of structure above when making connection thereto, and ensure that no structural load is transmitted to glazing systems.
- .10 Fixing screws shall be countersunk and concealed. Screws shall be oval head, set flush with adjacent surfaces.
- .11 Assume full responsibility for the design of assemblies. Reinforcing, furring and anchoring shall suit each specific condition complying with the parameters previously specified, required and as shown.
- .12 Form accurate extrusions with clean, straight, sharply defined profiles free from any defects.
- .13 Form flashing bends with clean, straight, sharply defined profiles without damage and discolouration to finish.
- .14 Extrusion thickness shall be adequate to satisfy loading and deflection, as required and indicated.
- .15 Weld aluminum where required with inert metal arc equipment by methods recommended by the Aluminum Co. of Canada. Welders shall qualify according to CSA W47.2-11(R2020). Make exposed welds continuous and flush with adjacent surface. Do not mar surface finishes with welds in back of exposed aluminum. Do not deform the exposed metal and finish in any way by welding.
- .16 Weld steel, where required, in accordance with CSA W59-18. Welded joints shall be of adequate strength and durability with jointing tight and flush. Welder shall be fully approved by the Canadian Welding Bureau and shall comply with CSA W47.1-19, Division 3. Where it is necessary to weld components already galvanized, remove galvanizing for 50 mm (2") around weld and paint over welds where galvanizing is removed as specified hereinafter.
- .17 Insert concealed prime painted steel reinforcement into cavities of frame members to the interior side of integral air seal web, sized to adequately withstand wind pressure requirements specified.
- .18 Include aluminum cover plates, trim components, bent plates, closure trim, extruded glazing corner posts, drips, flashings and other components required to complete the installation and as indicated whether specifically labelled/dimensioned or only notionally indicated.
- .19 Trim glazing spline at continuous embedded sill flashing locations (to ensure full upturn of flashing) behind pressure plate.
- .20 Include thermal barriers, and miscellaneous neoprene pads, shims and washers.
- .21 *Provide* weepholes in the glazing recess to drain condensate and water to exterior wall cavity. *Provide* drainage tubes as necessary to conduct water safely through isolated insulated areas to direct exterior discharge. Seal around tubes.

Aluminum Framed Glazing Systems

- .22 Metal-to-metal joints which require sealing to maintain weathertightness shall be designed and assembled with a ribbon of sealant that shall be compressed by approximately 50% of its original thickness when the joints are secured.
- .23 Fabricate frame systems complete with mullions, head and sill frames, spigots, and plugs for horizontals, spline gaskets, thermal break pressure plates, filler pieces, snap-on caps, and other necessary components.
- .24 Sill flashing: extruded aluminum with vertical concealed legs for support, finished to match aluminum frames, clipped to full length continuous bent aluminum clip with vertical leg at back, 25 mm (1") projection beyond wall cladding surface unless otherwise indicated. *Provide* preformed drip deflectors for sill ends at jambs. *Provide* preformed butt joint and corner sill splice connectors and sealant to prevent water penetration. Locate splice connectors (joint covers) at centre line of mullions when required.

2.10 Fabrication - Hot Rolled Steel Framing

- .1 Fabricate necessary hot-rolled, framing and support members and non-corrosive anchorage members required to support the glazing systems, concealed from view.
- .2 Framing members shall be welded construction, designed for welding to weld plates supplied for casting into concrete for welding to steel structure.
- .3 Framing finishes:
 - .1 Exterior to air barrier exposure: Hot-dipped galvanized.
 - .2 Interior to air barrier exposure: Prime painted CISC/CPMA 2-75.

2.11 Fabrication Tolerances

- .1 Comply with the following maximum tolerances:
 - .1 Plumb: 3.2 mm in 3 m (1/8" in 10'-0"); 6.35 mm in 12.2 m (1/4" in 40'-0").
 - .2 Level: 3.2 mm in 3 m (1/8" in 10'-0"); 6.35 mm in 12.2 m (1/4" in 40'-0").
 - .3 Alignment:
 - .1 Where surfaces abut in line or are separated by reveal or protruding element up to 12.7 mm (1/2") wide, limit offset from true alignment to 1.6 mm (1/16").
 - .2 Where surfaces are separated by reveal or protruding element from 12.7 to 25.4 mm (1/2" to 1") wide, limit offset from true alignment to 3.2 mm (1/8").
 - .3 Where surfaces are separated by reveal or protruding element of 25.4 mm (1") wide or more, limit offset from true alignment to 6.4 mm (1/4").
 - .4 Variation from plane: 3.2 mm in 3.6 m (1/8" in 12'-0"); 12.7 mm (1/2") over total length.
 - .5 Square or rectangular: Maximum 3.2 mm (1/8") difference between diagonal measurements.
 - .6 Variation from indicated position: plus/minus 3 mm (1/8").
- .2 Tolerances shall not be cumulative.

Aluminum Framed Glazing Systems

PART 3 - EXECUTION

3.1 Installation - General

- .1 Verify dimensions of supporting structure by measurement at the *Place of the Work* so that aluminum framed glazing systems will be accurately designed, fabricated and fitted to the structure.
- .2 Coordinate with the work of other sections and hand-over items to be placed during the installation of other work at the proper time to avoid delays in the *Work*.
- .3 Erect frames complete with necessary reinforcing and incidental components.
- .4 Include anchors and fastenings shown, specified, or necessary to anchor work together or to work of separate sections. Supply items and inserts required to be built into other work. Submit instructions for proper location, and verify proper positioning. Survey location of imbeds after initial pour to verify tolerances.
- .5 Use anchors that will permit sufficient adjustment for accurate alignment.
- .6 Accurately fit and rigidly frame together units where required. Match components carefully to produce continuity of line and design. *Provide* flush hairline joints and weathertight connections.
- .7 Ensure adequate clearance and shim space at perimeter of openings.
- .8 After welding galvanized steelwork, touch-up weld areas with 2 coats of primer, zinc-rich at galvanized locations.

3.2 Installation Tolerances

- .1 Comply with the following maximum tolerances:
 - .1 Plumb: 3.2 mm in 3 m (1/8" in 10'-0"); 6.35 mm in 12.2 m (1/4" in 40'-0").
 - .2 Level: 3.2 mm in 3 m (1/8" in 10'-0"); 6.35 mm in 12.2 m (1/4" in 40'-0").
 - .3 Alignment:
 - .1 Where surfaces abut in line or are separated by reveal or protruding element up to 12.7 mm (1/2") wide, limit offset from true alignment to 1.6 mm (1/16").
 - .2 Where surfaces are separated by reveal or protruding element from 12.7 to 25.4 mm (1/2" to 1") wide, limit offset from true alignment to 3.2 mm (1/8").
 - .3 Where surfaces are separated by reveal or protruding element of 25.4 mm (1") wide or more, limit offset from true alignment to 6.4 mm (1/4").
 - .4 Variation from plane: 3.2 mm in 3.6 m (1/8" in 12'-0"); 12.7 mm (1/2") over total length.
 - .5 Square or rectangular: Maximum 3.2 mm (1/8") difference between diagonal measurements.
 - .6 Variation from indicated position: plus/minus 3 mm (1/8").
- .2 Tolerances shall not be cumulative.

Aluminum Framed Glazing Systems

3.3 Foamed-in-Place Insulation

- .1 Install between aluminum framing and rough openings at exterior walls and where indicated, in accordance with Section 07 21 00.

3.4 Isolation

- .1 Backpaint aluminum surfaces in contact with cement, concrete, masonry, plaster or dissimilar metals with heavy coat of bituminous paint.

3.5 Air Barrier Continuity with Building Envelope

- .1 *Provide* continuous air barrier transition between work of this section where work interfaces with building envelope air barrier materials. *Provide* EPDM or PVC glazing pocket filler or joint plug to seal glazing rebate where applicable; sealed airtight with silicone sealant.
- .2 Install in accordance with manufacturer's installation instructions. Seal lap joints and seal perimeter to adjacent building envelope air barrier material with silicone sealant.
- .3 Coordinate with adjacent materials for continuity and compatibility.

3.6 Glass and Glazing

- .1 Furnish glass for work of this section to requirements herein and in accordance with Section 08 80 00, and assume total responsibility for sizing, design and other aspects of glass work and accessories.

3.7 Sealant - Installation

- .1 *Provide* sealants associated with this section, following the requirements of Section 07 92 00. Make entire installation watertight.

3.8 Field Quality Control – Subcontractor

- .1 The *Subcontractor* is responsible for quality control of the work of this section including quality control of sub-*Subcontractors* and material suppliers for work of this section.
- .2 The *Subcontractor* shall develop a quality control manual for the factory and the field installation. The form of the manual shall be reviewed and accepted by the *Consultant*. This manual will document quality control practices of the *Subcontractor*, sub-*Subcontractors* and major material suppliers. The manual will include, but not be limited to, specific criteria related to:
 - .1 Surface preparation.
 - .2 Sealant mixing, tack time, set time, butterfly tests.
 - .3 Paint adhesion testing.
 - .4 Sealant adhesion testing.
 - .5 Material compatibility testing.
 - .6 Sealant staining of porous substrate testing.
 - .7 On line fabrication quality control practices.

Aluminum Framed Glazing Systems

- .8 Shipping.
- .9 Field installation.
- .3 The *Subcontractor* is to maintain a logbook (copies to be provided to the *Consultant* at completion of fabrication) documenting date, time, results, and significance of in plant testing carried out linked to daily panel production. The form of this logbook shall be reviewed and accepted by the *Consultant*.

3.9 Field Quality Control – Field Review

- .1 The *Owner* will engage the services of an independent inspection and testing company to carry out inspection and testing of work of this section.
 - .1 The cost of such inspection will be paid in accordance with Section 01 45 00.
- .2 Field review programme to include:
 - .1 Verification of proper insulation, vapour retarder, and air barrier installation.
 - .2 Checks of interface and termination seals against other elements.
 - .3 Review of panel to panel air seals, review of roof/wall interface.
 - .4 Review of panel fastening, exterior sealants etc.
 - .5 Checks of air and vapour seals/barriers for continuity, penetrations and correct orientation.
 - .6 Checks for continuity of insulation plane.
 - .7 Verification of flashing placement and continuity.
 - .8 Special review of interfaces between different elements such as wall/roof, curtain wall/masonry, to verify continuity of envelope performance.
 - .9 Review of exterior applied sealants and flashings.
 - .10 Confirmation of fastener size, type, and material.
 - .11 Review of drainage paths to confirm clear.
 - .12 Verification of glass type and position.

3.10 Adjusting and Cleaning

- .1 Adjust operating hardware and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
- .2 Remove as the work of this section progresses, corrosive and foreign materials which may set or become difficult to remove at time of final cleaning or which may damage members. Inspect as often as required to ensure cleanliness.
- .3 Remove non-permanent labels.
- .4 Remove dirt and residue from surfaces.

Aluminum Framed Glazing Systems

- .5 Remove *Products* or materials that have been broken, chipped, cracked, discoloured, abraded, or damaged during construction period and *Provide* undamaged *Products* or materials meeting the requirements of the *Contract Documents*.
- .6 Wash exposed surfaces with a cleaning solution approved by *Product* manufacturers.

3.11 Protection

- .1 At completion of the *Work*, remove protective coatings, clean glass and aluminum and remove surplus compounds and sealant materials. Replace or make good defective, scratched or damaged work.

END OF SECTION

Fire Rated Exterior Window System

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Fixed fire resistive exterior window system.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .2 Indicate with plans, sections, elevations and sufficient full size details, components and methods of assembly, materials and their characteristics relative to their purpose, and other fabrication information including relationships to adjacent systems.
 - .3 Identify and describe material types being supplied, wall thicknesses of metals, and shapes including connections and grades, dimensions and tolerances (minimum and maximum), attachments, reinforcing, anchorage and locations of fastenings, and provisions for thermal and structural movement between components of this section and adjacent materials.
 - .4 Include description of materials, metal finishing specifications, and other pertinent information.
 - .5 Design loads, typical reactions and support movement allowances, both vertical and horizontal, shall be placed on the shop drawings.
 - .6 Shop drawings shall clearly indicate the specification of materials and, where applicable, indicate installation methods and coordination with other sections.
- .4 Design calculations:
 - .1 Submit under seal, calculations prepared by the professional engineer responsible for the preparation of the shop drawings that clearly indicate the following:
 - .1 Design assumptions regarding loadings and seismic design, related to the building code.
 - .2 Which codes and standards calculations are based on.
 - .3 Materials proposed and their allowable shear and bending stresses.

Fire Rated Exterior Window System

- .4 Maximum and minimum tolerances for proposed materials including anchors, holes and spacings.
- .5 Testing data to confirm compliance with thermal performance and condensation resistance criteria.
- .6 Analysis for dead, wind, snow and guard loads as required and movements caused by temperature changes, support deflections and building sway.
- .7 Analysis to include anchors, glazing members, structural joints, sealants, and glass. Show section property computations for framing members and submit full sized drawings.
- .2 Calculations shall be prepared in a clear and comprehensive manner so that they can be easily reviewed. Incomplete or haphazard calculations will be rejected for resubmission.
- .5 Samples:
 - .1 Submit 450 mm (18") x 450 mm (18") size samples of types of window assemblies including with specified finishes. Submit 200 mm (8") long samples of typical component sections (head, jamb, sill, meeting rail, and the like), fully assembled, indicating glazing and weatherproof methods.
 - .2 Control samples:
 - .1 Submit two 305 mm (12") square samples of metal having specified finish of the required colours. Submit samples as many times as required to obtain approval of the range.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Maintenance data:
 - .1 Provide training to the *Owner* in the operation and maintenance of the steel framed glazing systems.
 - .2 Submit maintenance data for cleaning and maintenance for windows for incorporation into the operation and maintenance manuals.

1.5 Quality Assurance

- .1 Manufacturers:
 - .1 Company specializing in performing the work of this section with 10 years' documented experience, minimum, including successful completion of work of similar size and character.
- .2 Installer:
 - .1 Company:
 - .1 Authorized by the manufacturer for the installation of their systems.

Fire Rated Exterior Window System

- .2 Submit a letter signed by representative of fire rated exterior window system manufacturer with company's authorization stating that installer is acceptable and qualified to install system.
- .2 Foreperson experience: Shall have 10 years' experience, minimum, as glazing mechanic.
- .3 Typical glazing mechanic experience: Shall have 3 years' experience, minimum, as glazers.
- .3 Sole source design responsibility: Glass, glazing, system design and accessories are the sole responsibility of steel framed glazing system manufacturer.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Unless specified otherwise, glazing systems shall be designed to the following industry standards and references:
 - .1 IGMA North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.
 - .2 GANA Glazing Manual.
 - .3 American Architectural Manufacturers Association (AAMA).
- .2 Anchor design:
 - .1 Design anchors of the framing members to the building support to accommodate movements specified herein and to allow for construction tolerances.
- .3 Noise:
 - .1 Design the *Work* so that movements specified herein are accommodated without any audible noise being generated. In general, noise is produced by metal to metal contacts, and/or stresses being built up by movements and suddenly being relieved when friction forces are overcome.
- .4 Structural: Design components to the relevant sections of the building code, using limit states design methods.
- .5 Air infiltration/exfiltration rate:
 - .1 Fixed glazing: Maximum 0.1 L/s/m² (0.02 cfm/ft²) of glazing area when tested in accordance with ASTM E283-04 at test pressure of 300 Pa (6.27 psf).
- .6 Water resistance:
 - .1 Static; fixed and operable glazing: No water penetration shall occur when the work is tested in accordance with ASTM E331-00, amended to prohibit water from passing through interior glazing seals or frame joints, at a test pressure equal to 20% of positive design wind pressure and but not less than 300 Pa (6.27 psf).
- .7 Thermal: No condensation or frost shall form on the interior of glazing or framing members when tested under the following conditions:
 - .1 Interior air: 22°C, 30% R.H.

Fire Rated Exterior Window System

- .2 Exterior air: -20°C, 24 km/h (15 mph) wind speed.
- .8 Design glazing systems according to IGMAC Glazing Recommendations for Sealed Insulating Glass Units where applicable.
- .9 Assemblies shall be factory-welded or come complete with factory-installed mechanical joints and shall not require fabrication at the *Place of the Work*.
- .10 Assemblies shall bear permanent, non-removable label certifying it for use in tested and rated fire-protective and fire-resistive assemblies.
- .11 Fire-resistive rated assemblies: in accordance with listing and CAN/ULC S101-14.
- .12 Rated window (fixed glazing) assemblies; in accordance with listing and as follows:
 - .1 Tested to CAN/ULC-S106-15 and listed by a nationally recognized agency having a factory inspection service and shall be constructed as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
 - .2 Shall comply with NFPA 80-2013 and be listed and labelled for fire rating indicated, based on testing in accordance with NFPA 257-2012.
- .13 Impact Safety Resistance: in accordance with CAN/CGSB 12.1-M90.
- .14 Fire-ratings with hose stream test:
 - .1 Fire-resistive rating:
 - .1 90 minutes.

2.2 Materials

- .1 Framing system:
 - .1 Basis of design: SaftiFirst 'GPX Architectural Series'.
- .2 Glass:
 - .1 Fire resistive glazing:
 - .1 Fire-rated, impact safety-rated, and fire resistive glazing, clear laminated or tempered high visible light transmission glass laminated with an intumescent interlayer.
 - .1 Basis of Design: SaftiFirst 'SuperLite II-XL'.
 - .2 Insulated glass unit with Low E coating: in accordance with Section 08 80 00.
- .3 Insulation:
 - .1 Unfaced, slag-wool-fibre/rock-wool-fibre board insulation: ASTM C612-10, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E136-16a for combustion characteristics; and of the following nominal density and thermal resistivity:
 - .1 Nominal density of 64 kg/m³ (4 lb/ft³), Types IA and IB, thermal resistivity of 27.7 K x m/W at 24°C (4°F x h x ft²/Btu x inch at 75°F).
- .4 Accessories:

Fire Rated Exterior Window System

- .1 Fasteners: Type 304 or Type 316 stainless steel.
- .2 Glazing gaskets:
 - .1 Exterior applications:
 - .1 ASTM C864-05(2015); silicone compatible, extruded EPDM rubber that provides for silicone adhesion.
- .3 Intumescent tape: As recommended by fire rated glazing system manufacturer.
- .4 Setting blocks: Calcium silicate.
- .5 Perimeter anchors: As recommended by fire rated glazing system manufacturer.
- .6 Flashings: As recommended by manufacturer; same material and finish as cover caps.
- .7 Silicone sealant: One-part neutral curing silicone, medium modulus sealant, to ASTM C920-11, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable, gray colour.
 - .1 Acceptable *Products*:
 - .1 Dow Corning 795 - Dow Corning Corp.
 - .2 Silglaze-II 2800 - GE Silicones.
 - .3 Spectrem 2 - Tremco Inc.
- .8 Intumescent sealant: Intumescent caulk as recommended by fire rated glazing system manufacturer; designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.

2.3 Finishes – Aluminum

- .1 Exposed aluminum surfaces: 70% Kynar 500 or Hylar 5000 fluoropolymer resin systems, ceramic pigments and other select inorganic pigments in accordance with AAMA 2605-20.
 - .1 Acceptable *Products*:
 - .1 PPG 'Duranar'.
 - .2 Colour: to match existing.

2.4 Fabrication - General

- .1 Insofar as practical, execute fitting and assembly in the shop with the various parts or assemblies ready for erection at the *Place of the Work*.
- .2 Take field measurements and levels required to verify or supplement those shown for the proper layout and installation of the *Work*. Coordinate dimensional tolerances in adjacent building elements and confirm prior to the commencement of the work of this section. Commencement of installation floor by floor shall be construed as acceptance of building conditions. Curtainwall shall not deviate from tolerances specified.

Fire Rated Exterior Window System

- .3 Verify measurements at the *Place of the Work* and fabricate systems to suit dimensions at the *Place of the Work*.
- .4 Conceal nuts, bolts, screws, clips and other means of fastening in finished *Work*, except where shown or specified otherwise.
- .5 Maintain dimensional tolerances from vertical and horizontal planes with the closest possible accuracy for the various parts as previously designated.
- .6 Means of anchoring systems shall have sufficient adjustment to permit correct and accurate alignment. After adjustment, positively lock anchorage devices in manner to preclude movement, once alignment is achieved.
- .7 Isolate aluminum bearing contact with dissimilar materials other than air/vapour seal. Method of isolation shall be to *Consultant's* acceptance.
- .8 Make allowances for deflection of structure above when making connection thereto, and ensure that no structural load is transmitted to aluminum curtainwall and cladding systems.
- .9 Fixing screws shall be countersunk and concealed. Screws shall be oval head, Phillips head, set flush with adjacent surfaces.
- .10 Assume full responsibility for the design of assemblies. Reinforcing, furring and anchoring shall suit each specific condition complying with the parameters previously specified, required and as shown.
- .11 Form accurate extrusions with clean, straight, sharply defined profiles free from any defects.
- .12 Extrusion thickness shall be adequate to satisfy loading and deflection, as required and indicated.
- .13 Weld aluminum where required with inert metal arc equipment by methods recommended by the Aluminum Co. of Canada. Welders shall qualify according to CSA W47.2-11(R2015). Make exposed welds continuous and flush with adjacent surface. Do not mar surface finishes with welds in back of exposed aluminum. Do not deform the exposed metal and finish in any way by welding.
- .14 Weld steel, where required, in accordance with CSA W59-13. Welded joints shall be of adequate strength and durability with jointing tight and flush. Welder shall be fully approved by the Canadian Welding Bureau and shall comply with CSA W47.1-09(R2014), Division 3. Where it is necessary to weld components already galvanized, remove galvanizing for 50 mm (2") around weld and paint over welds where galvanizing is removed as specified hereinafter.
- .15 Insert concealed galvanized and zinc chromate coated steel reinforcement into frame members and other units as required, sized to adequately withstand wind pressure requirements specified.
- .16 Include cover plates, trim components, bent plates, closure trim, glazing corner posts, drips, flashings and other components required to complete the installation and as indicated whether specifically labelled/dimensioned or only notionally indicated.
- .17 Trim glazing spline at continuous embedded sill flashing locations (to ensure full upturn of flashing) behind pressure plate.

Fire Rated Exterior Window System

- .18 Include thermal barriers, and miscellaneous neoprene pads, shims and washers.
- .19 Where practical, prefabricate units in shop in accordance with *Contract Documents* and reviewed shop drawings. Units too large for handling or shipping shall be shop prefabricated, dismantled and marked for shipping and field assembly.
- .20 *Provide* weepholes in the glazing recess to drain condensate and water to exterior wall cavity. *Provide* drainage tubes as necessary to conduct water safely through isolated insulated areas to direct exterior discharge. Seal around tubes.
- .21 Metal-to-metal joints which require sealing to maintain weathertightness shall be designed and assembled with a ribbon of sealant that shall be compressed by approximately 50% of its original thickness when the joints are secured.
- .22 Fabricate frame systems complete with mullions, head and sill frames, spigots, and plugs for horizontals, spline gaskets, thermal break pressure plates, filler pieces, snap-on caps, and other necessary components.

PART 3 - EXECUTION

3.1 Examination

- .1 Take measurements at *Place of the Work* to ensure glazing systems will be accurately designed, fabricated and fitted in to the *Work*.
- .2 Notify responsible entity of unsatisfactory conditions affecting work of this section and do not proceed with installation until conditions are corrected.
- .3 Coordinate with work of other sections and hand-over items to be placed during the installation of other work at proper time to avoid delays in the *Work*.

3.2 Installation

- .1 Install work of this section in accordance with system manufacturer's written requirements, in compliance with listed assembly, and in compliance with reviewed shop drawings.
- .2 Erect frames complete with necessary reinforcing and incidental components.
- .3 Include anchors, dowels and fastenings shown, specified, or necessary to anchor work together or to work of separate sections. Supply items and inserts required to be built into other work. Submit instructions for proper location, and verify proper positioning.
- .4 Use anchors that will permit sufficient adjustment for accurate alignment.
- .5 Accurately fit and rigidly frame together units where required. Match components carefully to produce continuity of line and design. *Provide* flush hairline joints and connections weathertight.
- .6 Ensure adequate clearance and shim space at perimeter of openings.
- .7 After welding galvanized steelwork, touch-up weld areas with 2 coats of primer, zinc-rich at galvanized locations.
- .8 Firmly pack perimeter of framing system to rough opening with mineral wool fire stop insulation or appropriately rated intumescent sealant.

Fire Rated Exterior Window System

3.3 Installation Tolerances

- .1 Limit variations from plumb and level:
 - .1 3.2 mm in 6 m (1/8 inch in 20'-0") vertically and horizontally.
 - .2 6 mm in 12 m (1/4 inch in 40'-0") either direction.
- .2 Limit offsets in theoretical end-to-end and edge-to-edge alignment:
 - .1 1.6 mm (1/16 inch) where surfaces are flush or less than 12.7 mm (1/2") out of flush and separated by not more than 50 mm (2").
 - .2 3.2 mm (1/8") for surfaces separated by more than 50 mm (2").
- .3 Step in face: 1.6 mm (1/16 inch) maximum.
- .4 Jog in alignment: 1.6 mm (1/16 inch) maximum.
- .5 Location: 6 mm (1/4") maximum deviation of any member at any location.
- .6 Tolerances are not accumulative.

3.4 Isolation

- .1 Backpaint aluminum surfaces in contact with cement, concrete, masonry, plaster or dissimilar metals with heavy coat of bituminous paint.

3.5 Air Barrier Continuity with Building Envelope

- .1 *Provide* continuous air barrier transition between work of this section where work interfaces with building envelope air barrier materials, using air barrier membrane or sheet metal air barrier, singly or in combination.

3.6 Glass and Glazing

- .1 Furnish glass for work of this section to requirements herein and in accordance with Section 08 80 00, and assume responsibility for sizing, design and other aspects of glass work and accessories.

3.7 Installation - Sealant

- .1 *Provide* sealants associated with this section, following the requirements of Section 07 92 00. Make entire installation watertight.

3.8 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.9 Adjusting and Cleaning

- .1 Remove as the work of this section progresses, corrosive and foreign materials which may set or become difficult to remove at time of final cleaning or which may damage members. Inspect as often as required to ensure cleanliness.

Fire Rated Exterior Window System

- .2 Wash exposed metal surfaces with a cleaning solution approved by manufacturers of glass and aluminum.
- .3 At completion of the *Work*, remove protective coatings, clean glass and aluminum and remove surplus compounds and sealant materials. Replace or make good defective, scratched or damaged work.

END OF SECTION

Finish Hardware

PART 1 - GENERAL

1.1 Summary

.1 Section includes:

- .1 Supply and off-load to place in a clean, dry, and secure room at the *Place of the Work*, which has been designated for storage of all finish hardware specified including necessary fastening devices.
- .2 Supply all finish hardware required and not supplied under other Sections.
- .3 Check and verify hardware information on door and frame shop drawings, prior to fabrication.
- .4 Packaging, labelling, provision of installation instructions, templates, fixings and similar items, and delivery to the *Work* site.
- .5 Give assistance at the *Place of the Work* to organize hardware storeroom and supply qualified staff to correctly categorize, mark, and arrange each item in groups to enable efficient dispensing in specified hardware groups for each door to installation trades.
- .6 Provide qualified staff at the *Place of the Work* promptly to assist installation trades subsequent to being requested and to ensure that hardware is being correctly installed.
- .7 Upon completion of installation of hardware, hardware *Supplier* shall arrange and conduct, in company of *Consultant* and *Contractor*, inspections to verify that all hardware is installed and functioning satisfactorily, and where necessary shall recommend adjustments of such items as closer arms, valves, door holders and latch and locksets. Report comments in writing to *Consultant* and *Contractor*.
- .8 Supply temporary locking cylinders and keys for construction purposes. Locks used for *Contractor's* security shall be keyed as required to conform to building operations' security requirements.

1.2 Administrative Requirements

.1 Coordination:

- .1 Coordinate work of this section to ensure information and material is promptly provided, to ensure orderly and expeditious progress of the *Work*, and to comply with schedule for completion.
- .2 Within 3 weeks of *Contract Award*, submit confirmed orders to manufacturers/*Suppliers* to *Consultant*.
- .3 Assist *Contractor* to organize hardware storeroom and supply qualified staff to correctly categorize, mark, and arrange each item in groups to enable efficient dispensing in specified hardware groups for each door to installation trades.

Finish Hardware

- .4 Coordinate the work of this section to ensure supplied hardware can function as required and can be installed within the particular details of the door and frame assemblies. Hardware that cannot be installed or will not function as intended will be replaced at no cost to the *Owner*.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Schedules and samples:
 - .1 Prepare and submit for review, a finish hardware schedule with technical product data sheets for use in the *Work*. List type, selected manufacturer's name and number, location, mounting heights and finish of hardware, and complete cross reference to door schedule.
 - .2 The indication or omission of a hardware component on the hardware schedule does not remove the responsibility of this section to ensure that all hardware can be installed and will function as intended.
 - .3 Submit samples of complete line of hardware and finishes. Identify samples indicating hardware item numbers used in the Finish Hardware Schedule, manufacturer's numbers, names, types, finishes, sizes and indication of door location(s). Approved samples will be retained for comparisons and returned upon completion of the *Work*.
 - .4 Prepare and submit for review, a keying schedule recognizing *Owner* requirements which shall be determined after award of *Contract*.
- .4 Templates:
 - .1 Submit for distribution, 3 copies of templates, template information, installation instructions and details necessary to enable preparation for, and installation of finish hardware in accordance with Door Hardware Institute recommended procedures. Submit templates arranged and marked coincident with specified hardware designations.
 - .2 Submit promptly when requested, the foregoing information in 3-ring plastic hard-covered binders suitably identified.
 - .3 In lieu of 1.3.4.1 arrange for the issue by each hardware manufacturer, the manufacturer's standard book of template drawings, at the option of door and frame manufacturers.
- .5 Jigs:
 - .1 Submit template jigs for each component to be recessed to enable installation trades to prepare doors to preclude misalignment and improper fit.

Finish Hardware

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Instruct the *Owner's* designated representative in proper care and preventative maintenance of hardware to assure longevity of operation.
 - .2 Submit maintenance data for cleaning and maintenance of finish hardware.
- .3 Submit to building maintenance staff prior to date of *Substantial Performance*, two sets of wrenches for door closers, locksets and fire exit hardware.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 *Supplier*:
 - .1 Shall have 5 years' experience, minimum, in *Products*, systems and assemblies specified and with approval of *Product* manufacturers.

1.6 Delivery, Storage, and Handling

- .1 Package each item of hardware individually, complete with trim and necessary fastenings, and accessories, including wrenches, keys, and other appurtenances required to ensure correct installation. Mark each item as to contents and appropriate use in specified groups.
- .2 All items of hardware subject to handling when installed shall be submitted with an easily removable covering to protect against scratches, abrasions, coating with dissimilar finish materials on adjacent surfaces, and tarnishing.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Comply with codes and requirements of governing authorities, and as specified.
- .2 *Provide* hardware items with characteristics to meet specified fire ratings, and conform to exit requirements of governing authorities.

2.2 Materials

- .1 Finish hardware: in accordance with Finish Hardware Schedule.

PART 3 - EXECUTION

3.1 Examination

- .1 Before furnishing any hardware, carefully check *Contract Documents*, verify door swings, door and frame materials and operating conditions, and assure that hardware will fit work to be attached.

Finish Hardware

- .2 Check shop drawings and frame and door lists affecting hardware type and installation, and verify to correctness thereof, or advise of required revisions. Check that doors, frames and panels requiring additional support are reinforced.
- .3 Point out special requirements to installer. Make final adjustment of hardware, in particular closer arms, valves and locksets, to work properly.

3.2 Installation

- .1 Install in accordance with manufacturer's written installation requirements. Refer also to installation requirements indicated, and specified in other sections of specifications.
- .2 Accurately locate and adjust hardware to meet manufacturer's written requirements. Use special tools and jigs as recommended.
- .3 Locate door stops to contact doors 75 mm (3") from latch edge.
- .4 Refer to Section 08 14 00 with respect to factory preparation for hardware for wood doors. Install wood doors and applicable hardware, including hinges.
- .5 Take delivery of finishing hardware and install, except hardware specified as part of work of another section. Check each item as received.
- .6 Set, fit and adjust hardware according to manufacturer's directions, at heights later directed by *Consultant*. Hardware shall operate freely. Protect installed hardware from damage and paint spotting.
- .7 Sound and weather seals:
 - .1 Install seals to continuously seal entire perimeter of doors. Secure in place with non-ferrous screws, in accurate alignment.
 - .2 Maintain integrity of seal at head of doors fitted with closers. Adapt seals as required to achieve specified performance.
- .8 Pre-drill kickplates and doors prior to installation of kickplates. Apply with water-resistant adhesive and countersunk stainless steel screws.
- .9 Set thresholds on two continuous beads of polyurethane caulking fastened with a minimum of 4 countersunk screws.
- .10 At wood doors, use screw attachment for exit devices and closers except as follows:
 - .1 Use through-bolt attachment for exit devices and closers at mineral core doors.

3.3 Electrified Hardware

- .1 Install electronic components, security components such as magnetic locks, sentronic hold open devices door status switches, card readers, processors, transformers, and other electric devices.
- .2 Power wiring will be supplied and installed by Electrical Divisions 26, 27, and 28 including conduit, boxes and other electrical appurtenances, including connections and terminations. Be responsible for ensuring that all wiring work is done in accordance with the *Suppliers* wiring diagrams and directions.

Finish Hardware

- .3 Arrange for testing and commissioning of system by the distributor of the system. Submit a copy of reports to the *Consultant*.

3.4 Keying

- .1 Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- .2 Submit Construction Master Keying (CMK) and Grand Master Keying (GMK) upon completion of the work of this section.

3.5 Field Quality Control

- .1 Field tests and inspections:
 - .1 Inspect the installation of finish hardware on an agreed frequency.
 - .2 Advise in writing of work being performed that will prejudice the installation or correct operation of items of hardware.
 - .3 Ensure items have been installed complete with required trim and accessories, and fastenings are adequately secured and approved. Ensure closer arms, valves, holder devices, locksets and latchsets are correctly adjusted.

3.6 Adjusting and Cleaning

- .1 Adjust doors to swing freely, smoothly and easily, to remain stationary at any point, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force.
- .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 *Supplier's* requirements.
- .3 Ensure that doors equipped with closers operate to close doors firmly against anticipated wind and building air pressure, and to enable doors to be readily opened as suitable for function, location and traffic.
- .4 Clean hardware after installation in accordance with *Supplier's* requirements.

END OF SECTION

DOOR HARDWARE

08 71 00

PROJECT:



Guelph General Hospital – Emergency Mental Health & Addiction
Services Relocation and Emergency Department Expansion.
115 Delhi Street,
Guelph, Ontario, Canada

ARCHITECT:



Stantec Architecture Ltd.
100-401 Wellington Street West
Toronto, Ontario, Canada

Prepared By: Alex Bekmansourov
Date: December 12, 2023
Revised: February 29, 2024
Revised: April 16, 2024

Architectural Hardware Finishes

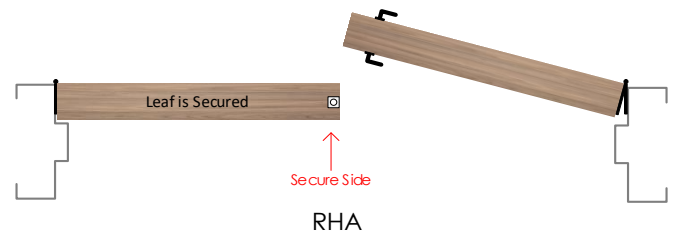
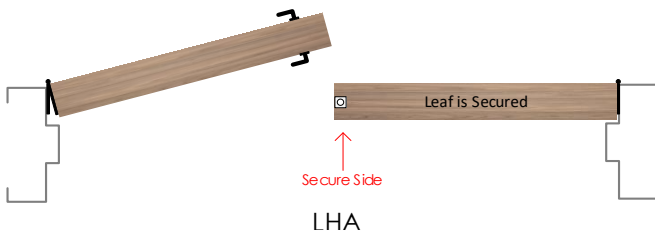
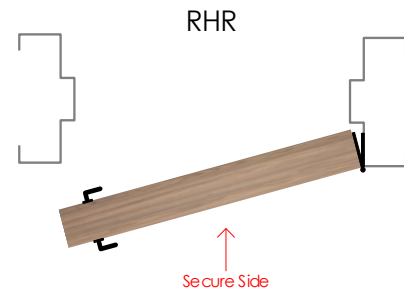
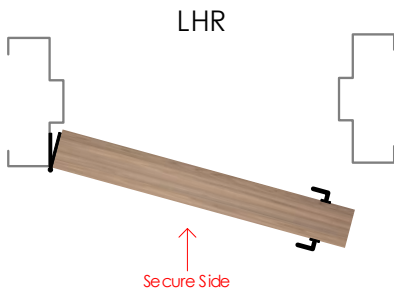
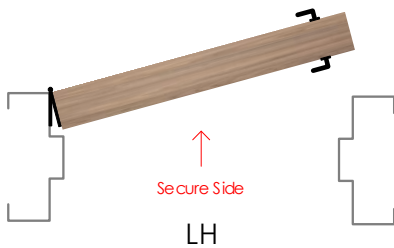
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Clear Anodized / Painted Aluminum					
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Satin Nickel					
646		619	670		US15
Polished Nickel					
645		618	669		US14
Satin Stainless Steel					
	630				US32D
Polished Stainless Steel					
	629				US32
Satin Chrome					
652		626	702		US26D
Polished Chrome					
651		625	672		US26
Satin Brass					
633		606	667	678	US4
Polished Brass					
632		605	666	677	US5
Satin Bronze					
639		612	668	680	US10
Oil Rubbed Bronze					
640		613	703	695	US10B
Flat Black / Anodized Black					
631		622	671	693	US19

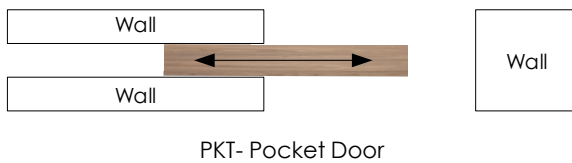
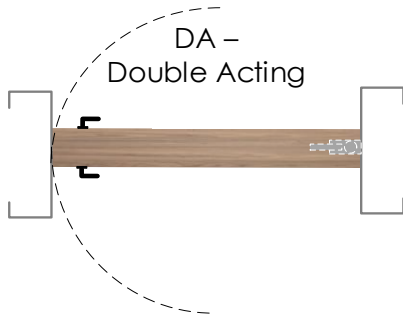
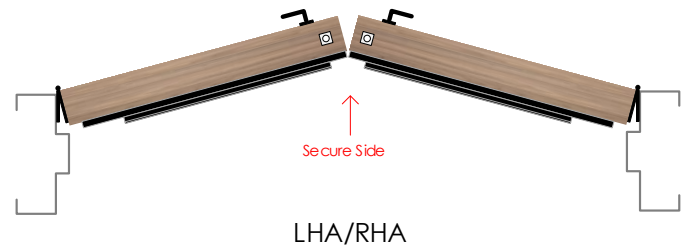
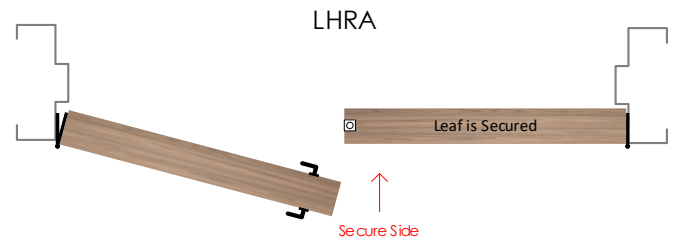
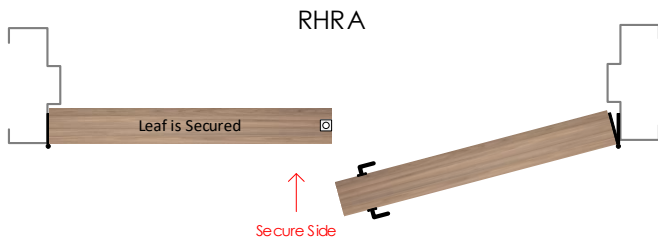
Door Handing's

Abbreviations

RH = Right Hand	RHA = Right Hand Active	SS = Single Slider
LH = Left Hand	LHA = Left Hand Active	BP = Bi-Parting Slider
RHR = Right Hand Reverse	RHA/LHA = Right & Left Hands Active	BF = Bi-Folding Slider
LHR = Left Hand Reverse	RHRA/LHRA = Right & Left Hand Reverse Active	TS = Telescopic Slider
RHRA = Right Hand Reverse Active	DA = Double Acting	PKT = Pocket Slider
LHRA = Left Hand Reverse Active	DE = Double Egress	

NOTE: The handing of a swing door is determined by placing yourself on the secured or keyed side of the door.







BP- Bi Parting Sliding Door



BPS- Bi Passing Sliding Door

Products & Alternatives

NOTE: Only those products / brands listed here are acceptable and should be used to form a bid price. No unsolicited products will be considered. If acceptable alternates are listed here those too can be used to form a bid price provided, they are exactly the same as the specified item. If using an alternate product to form a price it is the bidder's responsibility to ensure that product is identical in every way to the specified item. If no alternates are listed, no alternate products are acceptable.

Product Type	Product#	Manufacturer	Alternate Manufacturer 1	Alternate Manufacturer 2
Continuous Hinge	SL14HD HT	Select	Ives	Pemko
Anti Ligature Continuous Hinges	CH 993	Gallery	Lawrence	Markar
Mortise Locks	L9000 Series	Schlage	N/A	N/A
Anti Ligature Locks	CH9000SEC	Accurate		
Exit Devices	98 Series	Von Duprin	Sargent	
Electric Strike	1500C	HES	N/A	N/A
Concealed Overhead Stop	100S	Glynn Johnson	Rixson	N/A
Auto Operator	Mitec	Mitec		
Push Button Actuator	CM330 Series	Camden	BEA	N/A
Kick Plate	GSH 80A	Gallery	CBH	Gallery
Armour Plates	GSH 90F	Gallery	CBH	Gallery
Flush Bolts/Co-Ordinators	FB458/F51P/COR	Ives	Pemko	Standard Metal
Gasketing	W-66	KN Crowder	Pemko	Zero
Auto Door Bottom	CT-54	KN Crowder	Pemko	Zero

Symbols



- Door has a fire rating and all associated hardware must have a fire label to suit. Must comply with local requirements.



- Door is automatic and is equipped with an auto operator. Door must meet local barrier free codes



- Door has an electrical requirement and requires power to be brought to the appropriate location above the door or to the latch, for either security or barrier free applications. Refer to security & electrical drawings for further information.



- Door requires security card access. Refer to security / electrical drawings for further information.

Abbreviations

Door:

HMD = Hollow Metal Door
IHMD = Insulated Hollow Metal Door
ALD = Aluminum Door
IC-ALD = Insulated Clad Aluminum Door
SCWD = Solid Core Wood Door
HCWD = Hollow Core Wood Door
FGD = Frameless Glass Door
FRP = Fiberglass Reinforced Plastic Door

Frame:

HMF = Hollow Metal Frame
ALF = Aluminum Frame
Cased Open HMF = Cased Open Hollow Metal Frame
WDF = Wood Frame
Cased Open WDF = Cased Open Wood Frame
Cased Open Drywall = Cased Open Drywall

Fire Ratings:

0 HR – Zero Hour Fire Rating / Smoke Barrier
20 MIN – 20 Minute Fire Rating
¾ HR – 45 Minute Fire rating
1 ½ HR – 90 Minute Fire Rating
2 HR – 120 Minute Fire Rating
3 HR – 180 Minute Fire Rating

Disclaimer

Weblinks:

Weblinks do change from time to time as manufacturers move around their websites, please inform us if you have a none functioning weblink.

HARDWARE SCHEDULE



Heading# 1

Opening Information					
Opening Type:	Pair	Opening Size:	1 x 965 x 2150 x 45 – 1 x 535 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None


5	Total Openings							
1	Door#	1088.5	Location:	Corridor 1081	To	Office/Treat 1088.5	Handing:	DE
1	Door#	1088.4	Location:	Corridor 1081	To	Office/Treat 1088.4	Handing:	DE
1	Door#	1088.3	Location:	Corridor 1081	To	Office/Treat 1088.3	Handing:	DE
1	Door#	1088.2	Location:	Corridor 1081	To	Office/Treat 1088.2	Handing:	DE
1	Door#	1088.1	Location:	Corridor 1081	To	Office/Treat 1088.1	Handing:	DE

Web Link

Site Verified

By Hardware Supplier

5	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
5	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
5	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
5	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
5	Cyl. Operated Flush Bolt	1870HM x 610mm x Torx 628 (Mount at Header)	630 / US32D / Satin Stainless Steel	Adams Rite		<input type="checkbox"/>
5	Mortise Cylinder	20-062-ICX x B520-253 –Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
5	Cylinder Collar	COL6 x C26D	626 / US26D / Satin Chrome	Canropa		<input type="checkbox"/>
5	Overhead Stop	104S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
5	Overhead Stop	101S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
10	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
10	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
5	Ligature resistant Seals	188S-BK-ZAG x 6500	Black	Zero		<input type="checkbox"/>
5	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
5	Auto Door Bottom	CT-54 x 535	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier						
5	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
5	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
5	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
10	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
5	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
5	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
10	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

-----End of Heading-----



Heading#

2

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	0 HR

1	Total Openings							
1	Door#	1087	Location:	Corridor 1081	To	HSKG 1087	Handing:	LH

Web Link

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By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

SPYDER SC

26 Dale Crescent, Cookstown, Ontario, L0L 1L0

spydersc.com

416-910-8472

alex.b@spydersc.com

Page 9 of 89

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

-----End of Heading-----












Heading# 3

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

3	Total Openings							
1	Door#	1086	Location:	Corridor 1081	To	Soiled Utility 1086	Handing:	RH
1	Door#	1085	Location:	Corridor 1081	To	Soiled Utility 1086	Handing:	LH
1	Door#	1092.2	Location:	Care Team STN 1071.1	To	Medication 1092.2	Handing:	RH

Web Link
Site Verified

By Hardware Supplier						
3	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
3	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
3	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
3	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
3	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
3	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
3	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
3	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
3	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier					
3	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
3	REX Sensor	Built into lockset security to wire			<input type="checkbox"/>
3	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
3	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
3	Access Controller	To suit building system, by security provider			<input type="checkbox"/>
3	Power Supply	To suit building system, by security provider			<input type="checkbox"/>

By Owner

3	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

.....End of Heading.....

Heading# 4

Opening Information

Opening Type:	Pair	Opening Size:	2 x 750 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1 Total Openings

1	Door#	1080	Location:	Corridor 1081	From	IT Closet 1080	Handing:	RHRA
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Web Link

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By Hardware Supplier

2	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Storeroom Lockset	L9080T x 06B x 630 (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
2	Flush Bolts	FB458UL x C26D	626 / US26D / Satin Chrome	Adams Rite		<input type="checkbox"/>
1	Dust Proof Strike	DP-2	630 / US32D / Satin Stainless Steel	Ives		<input type="checkbox"/>
1	Door Closer	4111 x PA x 689 (LCN/ST 2779) – Active Leaf	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
2	Overhead Stop	103F (With Friction Hold Open)	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
4	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX (Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6500	Black	KN Crowder		<input type="checkbox"/>
1	Z-Astragal	By HM Door Provider				

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>
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.....End of Heading.....



Heading#

5

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings								
1	Door#	1083	Location:	Corridor 1081	To	WR (\$)	1083	Handing:	RH

Web Link

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By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Mortise Cylinder	20-062-ICX x B520-253 –Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>

1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Push to Lock Button	To suit building system, by security provider – to Disable C/R While Washroom is in Use. Use LX or Door Contact to Reset after Exit.				
1	Occupancy Indicator Light	To suit building system, by security provider – to Light Up While Washroom is in Use via Push to Lock Button. Use LX or Door Contact to Reset after Exit.				
By Owner						
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

.....End of Heading.....



Heading#

6

Opening Information					
Opening Type:	Pair	Opening Size:	2 x 750 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1084	Location:	Corridor 1081	From	ALC. Storage 1084	Handing:	RHRA
1	Door#	1150	Location:	Elevator lobby 1049	To	ALC. Storage 1150	Handing:	RHRA



Web Link

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By Hardware Supplier

2	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
2	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
2	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
2	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
4	Flush Bolts	FB458UL x C26D	626 / US26D / Satin Chrome	Adams Rite		<input type="checkbox"/>
2	Dust Proof Strike	DP-2	630 / US32D / Satin Stainless Steel	Ives		<input type="checkbox"/>
2	Door Closer	4111 x PA x 689 (LCN/ST 2779) – Active Leaf	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
4	Overhead Stop	103F (With Friction Hold Open)	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
4	Flush Bolts	FB458UL x C26D	626 / US26D / Satin Chrome	Adams Rite		<input type="checkbox"/>
8	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX (Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>

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2	Smoke/Sound Seal	W-66 x 6500	Black	KN Crowder		<input type="checkbox"/>
2	Z-Astragal	By HM Door Provider				
By Security Supplier						
2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
2	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
2	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
4	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
2	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
2	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
2	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

.....End of Heading.....



Heading#



7

Opening Information					
Opening Type:	Pair	Opening Size:	1 x 965 x 2150 x 45 – 1 x 610 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

3	Total Openings							
1	Door#	1066.A	Location:	Corridor 1081	To	Group RM 1066	Handing:	LHA
1	Door#	1066	Location:	Corridor 1065	To	Group RM 1066	Handing:	RHA
1	Door#	1090.1	Location:	Corridor 1065	To	Injection 1090.1	Handing:	RHA

Web Link
Site Verified

By Hardware Supplier						
3	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
3	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
3	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
3	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
3	Semi-Auto Flush Bolts	FB51P	630 / US32D / Satin Stainless Steel	Ives		<input type="checkbox"/>
3	Dust Proof Strike	DP-2	630 / US32D / Satin Stainless Steel	Ives		<input type="checkbox"/>
3	Coordinator	COR42 x FL20	628 / US28 / Clear Anodized	Ives		<input type="checkbox"/>
3	Mounting Bracket	MB2	628 / US28 / Clear Anodized	Ives		<input type="checkbox"/>
6	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
6	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
3	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
3	Overhead Stop	102S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
6	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX (Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
6	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX (Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
3	Ligature resistant Seals	188S-BK-ZAG x 6700	Black	Zero		<input type="checkbox"/>
3	Door Sweep	W-24S-SS x 965 x TORX (Mount on Pull Side)	630 / US32D / Satin Stainless Steel	KN Crowder		<input type="checkbox"/>

3	Door Sweep	W-24S-SS x 610 x TORX (Mount on Pull Side)	630 / US32D / Satin Stainless Steel	KN Crowder		<input type="checkbox"/>
By Security Supplier						
3	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
3	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
3	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
6	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
3	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
3	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
3	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

-----End of Heading-----



Heading#

8

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1092.2A	Location:	Injection 1090.1	to/from	Medication 1092.2	Handing:	LH

Web Link

Site Verified

By Hardware Supplier						Web Link	Site Verified
1	Door#	Location:	Opening Size:	Opening Type:	Hardware		
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select			<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin			<input type="checkbox"/>
1	Elec.Mortise Institutional Lockset	RX-LX-L9095EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage			<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN			<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN			<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson			<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery			<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder			<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder			<input type="checkbox"/>
By Security Supplier						Web Link	Site Verified
2	Door#	Location:	Opening Size:	Opening Type:	Hardware		
2	Card Reader	To suit building system, by security provider					<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire					<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire					<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider					<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider					<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider					<input type="checkbox"/>
By Owner						Web Link	Site Verified
2	Door#	Location:	Opening Size:	Opening Type:	Hardware		
2	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome				<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

-----End of Heading-----



Heading#

9


Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1092.2B	Location:	Corridor 1081	From	Medication 1092.2	Handing:	RHR

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9080T x 06B x 630(Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Electric Strike	1500C	630 / US32D / Satin Stainless Steel	HES	<input type="checkbox"/>
1	Electric Strike Protector	150 x C32D	630 / US32D / Satin Stainless Steel	HES	<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>
By Automatics Supplier					
1	Auto Operator	Micom Smart Swing 3 – Single Door – Push Mount.	628 / US28 / Clear Anodized	MICOM	<input type="checkbox"/>
2	Wave Button	CM-331/S/W/42/SGLR	630 / US32D / Satin Stainless Steel	Camden	<input type="checkbox"/>
1	Logic Relay	CX-33		Camden	<input type="checkbox"/>
By Security Supplier					
1	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
1	REX Sensor	Built into lockset & tied into non-secure side Wave Button - security to wire			<input type="checkbox"/>

1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

.....End of Heading.....

Heading# 10

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1071.2	Location:	Care Team STN 1071.1	to	ALC LKRS 1071.2	Handing:	RH

Web Link	Site Verified
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By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Passage Latchset	L9010 x 06B x 630	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>

.....End of Heading.....



Heading#

11

Opening Information					
Opening Type:	Single	Opening Size:	1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

2	Total Openings							
1	Door#	1077	Location:	Corridor 1074	To	WR (P) 1077	Handing:	DA
1	Door#	1072	Location:	Corridor 1070	To	WR (3PC) ACC 1072	Handing:	DA

Web Link

Site Verified

By Hardware Supplier

2	Double Acting hinge	DSH1000 x 2150	630 / US32D / Satin Stainless Steel	Markar		<input type="checkbox"/>
2	Emergency Release stop	ERS-84-C-HT-LH-NOTCH	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
2	Storeroom Lockset	CH 9159SEC-234-US32D-LH-134-LRCC.562-SP	630 / US32D / Satin Stainless Steel	Accurate		<input type="checkbox"/>
2	Mortise Cylinder	30-008 x B520-253 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
2	Electric Strike	1500C-TORX	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
2	Overhead Stop	105S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
4	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
2	Ligature resistant Seals	188S-BK-ZAG x 5400	Black	Zero		<input type="checkbox"/>

By Automatics Supplier

2	Auto Operator	Micom Smart Swing 3 – Single Door -Security Screws (Break Away Arm) – Corridor Side Mount	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
2	Wave to lock kit	CX-WC16 - Security Screws	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>

By Owner

2	Permanent Core	Permanent SFIC Coremax By NYGH	652 / US26D / Satin Chrome	Best		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

.....End of Heading.....



Heading#

12

Opening Information					
Opening Type:	Single	Opening Size:	1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1075	Location:	Corridor 1074	To	WR (P ACC) 1075	Handing:	DA

Web Link

Site Verified

By Hardware Supplier

1	Double Acting hinge	DSH1000 x 2150	630 / US32D / Satin Stainless Steel	Markar		<input type="checkbox"/>
1	Emergency Release stop	ERS-84-C-HT-RH-NOTCH	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Storeroom Lockset	CH 9159SEC-234-US32D-RH-134-LRCC.562-SP	630 / US32D / Satin Stainless Steel	Accurate		<input type="checkbox"/>
1	Mortise Cylinder	30-008 x B520-253 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Electric Strike	1500C-TORX	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Overhead Stop	105S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX(Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Ligature resistant Seals	188S-BK-ZAG x 5400	Black	Zero		<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator	Micom Smart Swing 3 – Single Door -Security Screws (Break Away Arm) – Corridor Side Mount	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
1	Wave to lock kit	CX-WC16 - Security Screws	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent SFIC Coremax By NYGH	652 / US26D / Satin Chrome	Best		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

.....End of Heading.....



Heading#

13

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1074	Location:	Corridor 1081	to/from	Corridor 1074	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec. Exit Device	RX-LX-QEL-98EO-NL-F x 110NL-MD x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Off-Set Door Pull	GSH 1180-3 x #2 MTG x 630	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Vandal Resistant Closer	4511-ST/2443-TBTRX	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Magnetic Lock	M680E-BD x Security Screws	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Fire Pull Station	As required by local jurisdiction				<input type="checkbox"/>

1	FA Disconnect	As required by local jurisdiction			
By Owner					
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.
- Magnetic Locks need to be tied in to fire control panel for disconnect in the event of fire.

-----End of Heading-----



Heading# 14

Opening Information					
Opening Type:	Single	Opening Size:	1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1076	Location:	Corridor 1074	To	WR (3PC) 1076	Handing:	DA

Web Link
Site Verified

By Hardware Supplier					
1	Double Acting hinge	DSH1000 x 2150	630 / US32D / Satin Stainless Steel	Markar	<input type="checkbox"/>
1	Emergency Release stop	ERS-84-C-HT-RH-NOTCH	628 / US28 / Clear Anodized	Pemko	<input type="checkbox"/>
1	Storeroom Lockset	CH 9159SEC-234-US32D-RH-134-LRCC.562-SP	630 / US32D / Satin Stainless Steel	Accurate	<input type="checkbox"/>
1	Mortise Cylinder	30-008 x B520-253 – Const. Keying	626 / US26D / Satin Chrome	Schlage	<input type="checkbox"/>
1	Electric Strike	1500C-TORX	630 / US32D / Satin Stainless Steel	HES	<input type="checkbox"/>
1	Overhead Stop	105S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX(Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Ligature resistant Seals	188S-BK-ZAG x 5400	Black	Zero	<input type="checkbox"/>

By Automatics Supplier					
1	Auto Operator	Micom Smart Swing 3 – Single Door -Security Screws (Break Away Arm) – Corridor Side Mount	628 / US28 / Clear Anodized	MICOM	<input type="checkbox"/>
1	Wave to lock kit	CX-WC16 - Security Screws	630 / US32D / Satin Stainless Steel	Camden	<input type="checkbox"/>

By Owner					
1	Permanent Core	Permanent SFIC Coremax By NYGH	652 / US26D / Satin Chrome	Best	<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

-----End of Heading-----



Heading#

15

Opening Information

Opening Type:	Single	Opening Size:	1220 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	3/4 HR

8	Total Openings							
1	Door#	1070.8	Location:	Corridor 1074	To	Patient RM 1070.8	Handing:	RH
1	Door#	1070.7	Location:	Corridor 1074	To	Patient RM 1070.7	Handing:	RH
1	Door#	1070.1	Location:	Corridor 1070	To	Patient RM 1070.1	Handing:	LH
1	Door#	1070.2	Location:	Corridor 1070	To	Patient RM 1070.2	Handing:	LH
1	Door#	1070.3	Location:	Corridor 1070	To	Patient RM 1070.3	Handing:	LH
1	Door#	1070.4	Location:	Corridor 1070	To	Patient RM 1070.4	Handing:	LH
1	Door#	1070.5	Location:	Corridor 1070	To	Patient RM 1070.5	Handing:	LH
1	Door#	1070.6	Location:	Corridor 1070	To	Patient RM 1070.6	Handing:	LH

Web Link

Site Verified

By Hardware Supplier

8	Continuous Hinge	EL-CH-953 HT x 2125 – 8WIRE - TORX	628 / US28 / Clear Anodized	Gallery		<input type="checkbox"/>
8	Elec. Institution Anti-Ligature Mortise Lock	CH-M9158E-SEC-LM-DPS-234-US32D-RH-134-LRCC.562-SP	630 / US32D / Satin Stainless Steel	Accurate		<input type="checkbox"/>
8	Elec. Institution Anti-Ligature Mortise Lock	CH-M9158E-SEC-LM-DPS-234-US32D-LH-134-LRCC.562-SP	630 / US32D / Satin Stainless Steel	Accurate		<input type="checkbox"/>
16	Mortise Cylinder	30-008 x B520-253 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
8	Vandal Resistant Closer	4211-TBTRX	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
8	Overhead Stop	106S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
16	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
8	Ligature resistant Seals	188S-BK-ZAG x 6000	Black	Zero		<input type="checkbox"/>
8	Auto Door Bottom	CT-54 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

16	Concealed Card Reader	To suit building system, by security provider – see elevation				<input type="checkbox"/>
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SPYDER SC


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Page 25 of 89

8	Door Contact / Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
8	Door Controller	To suit building system, by security provider				<input type="checkbox"/>
8	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
16	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

.....End of Heading.....

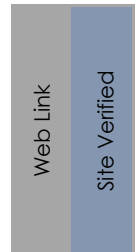


Heading#

16

Opening Information					
Opening Type:	Single	Opening Size:	610 x 2150 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	3/4 HR

8	Total Openings							
1	Door#	1070.8A	Location:	Corridor 1074	From	Patient RM 1070.8	Handing:	LHR
1	Door#	1070.7A	Location:	Corridor 1074	From	Patient RM 1070.7	Handing:	LHR
1	Door#	1070.1A	Location:	Corridor 1070	From	Patient RM 1070.1	Handing:	RHR
1	Door#	1070.2A	Location:	Corridor 1070	From	Patient RM 1070.2	Handing:	RHR
1	Door#	1070.3A	Location:	Corridor 1070	From	Patient RM 1070.3	Handing:	RHR
1	Door#	1070.4A	Location:	Corridor 1070	From	Patient RM 1070.4	Handing:	RHR
1	Door#	1070.5A	Location:	Corridor 1070	From	Patient RM 1070.5	Handing:	RHR
1	Door#	1070.6A	Location:	Corridor 1070	From	Patient RM 1070.6	Handing:	RHR



By Hardware Supplier					
8	Continuous Hinge	CH-953 HT x 2125 - TORX	628 / US28 / Clear Anodized	Gallery	<input type="checkbox"/>
8	Institutional Mortise Lockset	L9482T x LESS TRIM x LESS 1 CYL – (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
8	Mortise Cylinder Pull	GSH 980	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
8	Vandal Resistant Closer	4511-ST/2443-TBTRX	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
8	Drop Plate	4020-18``	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
8	Overhead Stop	102S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
8	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
8	Ligature resistant Seals	188S-BK-ZAG x 5400	Black	Zero	<input type="checkbox"/>
8	Auto Door Bottom	CT-54 x 610	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>
By Owner					
8	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

.....End of Heading.....



Heading#

17

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1070.1	Location:	Corridor 1070	to/from	Care Team STN 1070.1	Handing:	LH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-LV9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Vandal Resistant Closer	4511-ST/2443-TBTRX	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	105S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Ligature resistant Seals	188S-BK-ZAG x 5400	Black	Zero		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Magnetic Lock	M680E-BD x Security Screws	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Fire Pull Station	As required by local jurisdiction				<input type="checkbox"/>
1	FA Disconnect	As required by local jurisdiction				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.
- Magnetic Locks need to be tied in to fire control panel for disconnect in the event of fire.

-----End of Heading-----



Heading#

18

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1071.A	Location:	Corridor 1074	to/from	Care Team STN 1071	Handing:	RH

Web Link

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By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-LV9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Vandal Resistant Closer	4511-ST/2443-TBTRX	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	104S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Ligature resistant Seals	188S-BK-ZAG x 5400	Black	Zero		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Magnetic Lock	M680E-BD x Security Screws	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Fire Pull Station	As required by local jurisdiction				<input type="checkbox"/>
1	FA Disconnect	As required by local jurisdiction				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

.....End of Heading.....



Heading#

19

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1220 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1070	Location:	Corridor 1065	to/from	Corridor 1070	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec. Exit Device	RX-LX-QEL-98EO-NL-F x 110NL-MD x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Off-Set Door Pull	GSH 1180-3 x #2 MTG x 630	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Vandal Resistant Closer	4511-ST/2443-TBTRX	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	106S - SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6000	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Magnetic Lock	M680E-BD x Security Screws	630 / US32D / Satin Stainless Steel	Securitron		<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Fire Pull Station	As required by local jurisdiction				<input type="checkbox"/>
1	FA Disconnect	As required by local jurisdiction				<input type="checkbox"/>

By Owner

SPYDER SC

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

-----End of Heading-----



Heading#

20

Opening Information					
Opening Type:	Pair	Opening Size:	2-915 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	3/4 HR

1	Total Openings							
1	Door#	1092	Location:	Corridor 1092	From	Corridor 1063	Handing:	LHRA/RHRA

Web Link


Site Verified

By Hardware Supplier

2	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
2	Exit Device w/ Lever Classroom Trim	9847L-F x 996L x 06 Lever x LBR x 3'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
2	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
2	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
2	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
4	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 6330	Black	KN Crowder		<input type="checkbox"/>
1	Astragal Set	W-25 x 2150	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
2	Auto Door Bottom	CT-54 x 915	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
2	Magnetic Lock	M680E-BD-X (PIR) - Security Screws	630 / US32D / Satin Stainless Steel	Securiton		<input type="checkbox"/>
2	REX Sensor	C/W Maglock				<input type="checkbox"/>
2	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Fire Pull Station	As required by local jurisdiction				<input type="checkbox"/>

1	FA Disconnect	As required by local jurisdiction				<input type="checkbox"/>
By Owner						
2	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Magnetic Locks need to be tied in to fire control panel for disconnect in the event of fire.
- Electrical contractor to confirm the quantity of wires needed for wave buttons with the automatics provider prior to pulling wires.
- Exit Device Lever Trims May Be Optionally Locked If Required.

.....End of Heading.....



Heading#

21

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1092.A	Location:	Waiting 1091	to/from	Corridor 1081	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Exit Device w/ Lever Classroom Trim	98L-F x 996L x 06 x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6000	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Magnetic Lock	M680E-BD x Security Screws	630 / US32D / Satin Stainless Steel	Securiton		<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Fire Pull Station	As required by local jurisdiction				<input type="checkbox"/>
1	FA Disconnect	As required by local jurisdiction				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.
- Magnetic Locks need to be tied in to fire control panel for disconnect in the event of fire.

- Exit Device Lever Trims May Be Optionally Locked If Required.

-----End of Heading-----



Heading#

22

Opening Information					
Opening Type:	Single	Opening Size:	1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1093	Location:	Corridor 1092	To	WR P ACC 1093	Handing:	DA

Web Link

Site Verified

By Hardware Supplier

1	Double Acting hinge	DSH1000 x 2150	630 / US32D / Satin Stainless Steel	Markar		<input type="checkbox"/>
1	Emergency Release stop	ERS-84-C-HT-LH-NOTCH	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Storeroom Lockset	L9080T x 06B x 630 (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Electric Strike	1500C-TORX	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Overhead Stop	105S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator	Micom Smart Swing 3 – Single Door -Security Screws (Break Away Arm) – Corridor Side Mount	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
1	Wave to lock kit	CX-WC16 - Security Screws	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent SFIC Coremax By NYGH	652 / US26D / Satin Chrome	Best		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

-----End of Heading-----



Heading#

23

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1220 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	3/4 HR

1	Total Openings							
1	Door#	1065	Location:	Corridor 1065	to/from	Corridor 1099	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Exit Device w/ Lever Classroom Trim	98L-F x 996L x 06 x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	106S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6200	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Magnetic Lock	M680E-BD x Security Screws	630 / US32D / Satin Stainless Steel	Securiton		<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Fire Pull Station	As required by local jurisdiction				<input type="checkbox"/>
1	FA Disconnect	As required by local jurisdiction				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.
- Magnetic Locks need to be tied in to fire control panel for disconnect in the event of fire.

- Exit Device Lever Trims May Be Optionally Locked If Required.

-----End of Heading-----



Heading#

24

Opening Information

Opening Type:	Pair	Opening Size:	2-1150 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	3/4 HR

1	Total Openings							
1	Door#	1065.A	Location:	Corridor 1065	to/from	Existing Corridor	Handing:	DE

Web Link

Site Verified

By Hardware Supplier

2	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
2	Exit Device	9847EO-F x LBR x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
2	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
2	Overhead Stop	106S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
4	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 8500	Black	KN Crowder		<input type="checkbox"/>
2	Auto Door Bottom	CT-54 x 1150	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
2	Magnetic Lock	M680E-BD-X (PIR) - Security Screws	630 / US32D / Satin Stainless Steel	Securiton		<input type="checkbox"/>
2	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
1	Fire Pull Station	As required by local jurisdiction				<input type="checkbox"/>
1	FA Disconnect	As required by local jurisdiction				<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Magnetic Locks need to be tied in to fire control panel for disconnect in the event of fire.

- Electrical contractor to confirm the quantity of wires needed for wave buttons with the automatics provider prior to pulling wires.

-----End of Heading-----



Heading# 25

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1099.2	Location:	Corridor 1099	To	SSAU PSY 1099.2	Handing:	LH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-LV9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

.....End of Heading.....

Heading#

26

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1144	Location:	HSKP Storage 1141	To	WR 1144	Handing:	RH

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Privacy Latchset	LV9044 x 06B x L283-712 x L283-722 x 630	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>

.....End of Heading.....



Heading#

27

Opening Information					
Opening Type:	Pair	Opening Size:	1 x 965 x 2150 x 45 – 1 x 535 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1141	Location:	Corridor 1057	To	HSKP Storage 1141	Handing:	LHA

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
2	Flush Bolts	FB458UL x C26D	626 / US26D / Satin Chrome	Adams Rite	<input type="checkbox"/>
1	Dust Proof Strike	DP-2	630 / US32D / Satin Stainless Steel	Ives	<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
1	Overhead Stop	101S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 6500	Black	KN Crowder	<input type="checkbox"/>
1	Door Sweep	W-24S-SS x 965 x TORX (Mount on Pull Side)	630 / US32D / Satin Stainless Steel	KN Crowder	<input type="checkbox"/>
1	Door Sweep	W-24S-SS x 535 x TORX (Mount on Pull Side)	630 / US32D / Satin Stainless Steel	KN Crowder	<input type="checkbox"/>
By Security Supplier					
1	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire			<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
2	Door Contact	To suit building system, by security provider			<input type="checkbox"/>

1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

End of Heading



Heading# 28

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1043	Location:	HSKP Storage 1141	To	HSKP OFF 1143	Handing:	RH

Web Link
Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	104F (With Hold Open)	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Keypad Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>

1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

.....End of Heading.....

Heading# 29

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

0	Total Openings							
1	Door#	1853	Location:	Gift Shop 1103	From	HSKP Storage 1851	Handing:	LHR

Web Link
Site Verified

*DOOR DELETED

.....End of Heading.....



Heading#

30

Opening Information					
Opening Type:	Single	Opening Size:	1 x 695 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1142	Location:	HSKP Storage 1141	To	HSKP SUPER 1142	Handing:	LH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	103S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 695	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Keypad Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

End of Heading



Heading#

31

Opening Information					
Opening Type:	Single	Opening Size:	1 x 915 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	0 HR

1	Total Openings							
1	Door#	1133	Location:	Lobby	From	Janitor 1133	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 915	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

End of Heading



Heading#

32

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1140	Location:	CORR 1057	To	HSKP ST LOUNGE 1140	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 915	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

.....End of Heading.....

Heading# 33

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

0	Total Openings							
1	Door#	1857	Location:	Gift Shop 1103	To	Gift Shop OFF 1857	Handing:	LH

Web Link
Site Verified

***DOOR DELETED**

.....End of Heading.....



Heading# 34

Opening Information					
Opening Type:	Single	Opening Size:	1 x 915 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

0	Total Openings							
1	Door#	1858	Location:	Volunteer 1859	To	Volunteer - Coord	Handing:	RH
1	Door#	1859	Location:	Lobby	To	Volunteer 1859	Handing:	RH

Web Link
Site Verified

***DOORS DELETED**

-----End of Heading-----

Heading#

35

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1132.1	Location:	Vest. Male 1132	To	Male WR 1132.1	Handing:	RH

Web Link	Site Verified
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By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Door Pull	GSH 4012-3 x #5-2 MTL MTG	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Push Plate	GSH 81A – 150 x 400 (Rounded Corners) – TORX	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>
By Owner					
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

.....End of Heading.....

Heading#

36

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

2	Total Openings							
1	Door#	1132	Location:	Lobby	To	Vest. Male 1132	Handing:	LH
1	Door#	1131.A	Location:	Lobby	To	Vest. Female 1131	Handing:	LH

Web Link	Site Verified
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By Hardware Supplier					
2	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
2	Deadbolt	B463T x 09-544(Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
2	Door Pull	GSH 4012-3 x #5-2 MTL MTG	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
2	Push Plate	GSH 81A – 150 x 400 (Rounded Corners) – TORX	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
2	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
2	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
2	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
4	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
2	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
2	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>
By Owner					
2	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

.....End of Heading.....

Heading#

37

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1131	Location:	Vest. Female 1131	From	Female WR 1131.1	Handing:	RHR

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Door Pull	GSH 4012-3 x #5-2 MTL MTG	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Push Plate	GSH 81A – 150 x 400 (Rounded Corners) – TORX	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 965	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>

.....End of Heading.....



Heading#

38

Opening Information					
Opening Type:	Single	Opening Size:	Existing	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	None

1	Total Openings							
1	Door#	EX.1099.1	Location:	Corridor EX.1099	To	Manager Office EX.1099.1	Handing:	RH

Web Link
Site Verified

By Hardware Supplier						
		*BALANCE OF EXISTING HARDWARE TO REMAIN				
By Security Supplier						
2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
2	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
2	REX Sensor	To suit building system, by security provider				<input type="checkbox"/>
2	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
2	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
2	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
2	Electric Strike	To suit building system, by security provider				<input type="checkbox"/>
2	Storeroom Lockset	To suit building system, by security provider				<input type="checkbox"/>

*EXISTING DOOR TO REMAIN – SECURITY TO ADD CARD READER AND ALL REQUIRED COMPONENTS REQUIRED FOR CREDENTIAL ACCESS.

.....End of Heading.....

Heading# 39

Opening Information					
Opening Type:	Single	Opening Size:	Existing	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	None

1	Total Openings						
1	Door#	EX.1099	Location:	Corridor 1099	From	Room 1099.3	Handing:

Web Link
Site Verified

By Hardware Supplier

		*BALANCE OF EXISTING HARDWARE TO REMAIN			
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*EXISTING DOOR TO REMAIN – REPAINT.

-----End of Heading-----

Heading#

40

Opening Information					
Opening Type:	Single	Opening Size:	1 x 965 x 2150 x 45	STC Rating	None
Door Material:	SCWD	Frame Material:	HMF	Fire Rating	None

0	Total Openings							
1	Door#	EX.1103	Location:	Main Lobby 1001	From	Gift Shop 1103	Handing:	RHR

***DOOR DELETED**



.....End of Heading.....



Heading#

41

Opening Information					
Opening Type:	Single	Opening Size:	Existing	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	None

1	Total Openings						
1	Door#	EX.1057	Location:	Lobby	From	Corridor 1057	Handing:

Web Link	Site Verified
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By Hardware Supplier				
		*BALANCE OF EXISTING HARDWARE TO REMAIN		
By Security Supplier				
1	Card Reader	To suit building system, by security provider		<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider		<input type="checkbox"/>
1	REX Sensor	To suit building system, by security provider		<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider		<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider		<input type="checkbox"/>
1	Maglock	To suit building system, by security provider		<input type="checkbox"/>
1	Pull Station	To suit building system, by security provider		<input type="checkbox"/>
1	FA Disconnect	To suit building system, by security provider		<input type="checkbox"/>

*EXISTING DOOR TO REMAIN – SECURITY TO ADD CARD READER AND ALL REQUIRED COMPONENTS REQUIRED FOR CREDENTIAL ACCESS.

-----End of Heading-----



Heading#

42

Opening Information

Opening Type:	Single	Opening Size:	Existing	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	1 1/2 HR

1	Total Openings							
1	Door#	EX.1070	Location:	Existing Space	From	Corridor 1070	Handing:	RHR

Web Link

Site Verified

By Hardware Supplier

*BALANCE OF EXISTING HARDWARE TO REMAIN

By Security Supplier

2	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
2	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
2	REX Sensor	To suit building system, by security provider				<input type="checkbox"/>
2	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
2	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
2	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
2	Electric Strike	To suit building system, by security provider				<input type="checkbox"/>
2	Storeroom Lockset	To suit building system, by security provider				<input type="checkbox"/>
2	Maglock	To suit building system, by security provider				<input type="checkbox"/>
2	Pull Station	To suit building system, by security provider				<input type="checkbox"/>
2	FA Disconnect	To suit building system, by security provider				<input type="checkbox"/>

*EXISTING DOOR TO REMAIN – SECURITY TO ADD CARD READER AND ALL REQUIRED COMPONENTS REQUIRED FOR CREDENTIAL ACCESS.

-----End of Heading-----



Heading#

43

Opening Information					
Opening Type:	Pair	Opening Size:	2 x 915 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	1060.1	Location:	Corridor 1063	To	Mechanical Rom	Handing:	RHRA

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select	
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	
1	Semi-Auto Flush Bolts	FB51P	630 / US32D / Satin Stainless Steel	Ives	
1	Dust Proof Strike	DP-2	630 / US32D / Satin Stainless Steel	Ives	
1	Door Closer	4011 x REG x (LCN/ST 1544) – LH LEAF	689 / US28 / Painted Aluminum	LCN	
1	Drop Plate	4020-18 – LH LEAF	689 / US28 / Painted Aluminum	LCN	
1	Door Closer	4111 x PA x 689 (LCN/ST 2779) – RHR LEAF	689 / US28 / Painted Aluminum	LCN	
2	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson	
4	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery	
1	Smoke/Sound Seal	W-66 x 6500	Black	KN Crowder	

By Security Supplier					
1	Card Reader	To suit building system, by security provider			
1	REX Sensor	Built into lockset security to wire			
1	Latch Monitoring	Built into lockset security to wire			
2	Door Contact	To suit building system, by security provider			
1	Access Controller	To suit building system, by security provider			
1	Power Supply	To suit building system, by security provider			

By Owner					
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1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

-----End of Heading-----



Heading#

44

Opening Information					
Opening Type:	Single	Opening Size:	Existing	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	1 1/2 HR

1	Total Openings							
1	Door#	EX.1094	Location:	Exit Stair A 1094	From	Corridor 1070	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier

		*BALANCE OF EXISTING HARDWARE TO REMAIN			
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By Security Supplier

2	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
2	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
2	REX Sensor	To suit building system, by security provider			<input type="checkbox"/>
2	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
2	Access Controller	To suit building system, by security provider			<input type="checkbox"/>
2	Power Supply	To suit building system, by security provider			<input type="checkbox"/>
2	Electric Strike	To suit building system, by security provider			<input type="checkbox"/>
2	Storeroom Lockset	To suit building system, by security provider			<input type="checkbox"/>
2	Maglock	To suit building system, by security provider			<input type="checkbox"/>
2	Pull Station	To suit building system, by security provider			<input type="checkbox"/>
2	FA Disconnect	To suit building system, by security provider			<input type="checkbox"/>

*EXISTING DOOR TO REMAIN – SECURITY TO ADD CARD READER AND ALL REQUIRED COMPONENTS REQUIRED FOR CREDENTIAL ACCESS.

.....End of Heading.....

Heading# 45

Opening Information					
Opening Type:	Single	Opening Size:	Existing	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	None

1	Total Openings						
1	Door#	EX.1098	Location:	Existing Space	To	Mail Room 1098	Handing:

Web Link
Site Verified

By Hardware Supplier					
		*BALANCE OF EXISTING HARDWARE TO REMAIN			

*EXISTING DOOR & HARDWARE TO BE RELOCATED.

.....End of Heading.....



Heading#

46

Opening Information

Opening Type:	Pair	Opening Size:	2 x 915 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	2840	Location:	Corridor	From	Existing Corridor 2840	Handing:	RHRA

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Semi-Auto Flush Bolts	FB51P	630 / US32D / Satin Stainless Steel	Ives		<input type="checkbox"/>
1	Dust Proof Strike	DP-2	630 / US32D / Satin Stainless Steel	Ives		<input type="checkbox"/>
1	Coordinator	COR52 x FL20	628 / US28 / Clear Anodized	Ives		<input type="checkbox"/>
1	Mounting Bracket	MB2	628 / US28 / Clear Anodized	Ives		<input type="checkbox"/>
2	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
2	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
4	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6500	Black	KN Crowder		<input type="checkbox"/>
2	Door Sweep	W-24S-SS x 915 x TORX	630 / US32D / Satin Stainless Steel	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire			<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
2	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider			<input type="checkbox"/>

1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

.....End of Heading.....

Heading# 47A

Opening Information					
Opening Type:	Pair	Opening Size:	Existing	STC Rating	None
Door Material:	Existing	Frame Material:	Existing	Fire Rating	None

1	Total Openings						
1	Door#	EX.2240.1	Location:	Existing Corridor 2840	From	Mechanical Room 2841	Handing:

Web Link
Site Verified

By Hardware Supplier

		*BALANCE OF EXISTING HARDWARE TO REMAIN			
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*EXISTING DOORS & HARDWARE TO BE REMAIN.

.....End of Heading.....



Heading#

47B

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1100 x 2150 x 45	STC Rating	None
Door Material:	IHMD	Frame Material:	HMF	Fire Rating	1 1/2 HR

0	Total Openings							
1	Door#	2200.1	Location:	Exterior	From	STAIR Y	Handing:	RHR

***DOOR REMOVED FROM SCOPE**



.....End of Heading.....



Heading#

48

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3454	Location:	Corridor 3460	To	IT 3454	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

End of Heading



Heading#

49

Opening Information					
Opening Type:	Single	Opening Size:	1 x 2400 x 2400	STC Rating	None
Door Material:	ALD	Frame Material:	ALF	Fire Rating	None

1	Total Openings							
1	Door#	3450	Location:	Exterior	From	Walk-In Entrance Vest 3450	Handing:	BI-PASS

Web Link

Site Verified

By Automatics Sliding Door Supplier

1	Automatic Sliding Door System	Micom SL800 – Complete Automatic Sliding Door System with breakout panels, sidelights, integrated Panic bars, Auto Carriage Locks, Integrated Closers, Motion Sensors, Presence Sensors, Integrated Door Contacts, Single Rotary Key Switch to accept 1 1/4" Mortise cylinder in lieu of toggle jamb mounted.	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
1	Mortise Cylinder	20-062-ICX x B520-253 –Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>

By Security Supplier

1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
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By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

End of Heading



Heading#

50

Opening Information					
Opening Type:	Single	Opening Size:	1 x 2400 x 2400	STC Rating	None
Door Material:	ALD	Frame Material:	ALF	Fire Rating	None

1	Total Openings							
1	Door#	3450.A	Location:	Walk-In Entrance Vest 3450	From	Waiting Triage 3461	Handing:	BI-PASS



By Automatics Sliding Door Supplier

1	Automatic Sliding Door System	Micom SL800 – Complete Automatic Sliding Door System with breakout panels, sidelights, integrated Panic bars, Auto Carriage Locks, Integrated Closers, Motion Sensors, Presence Sensors, Integrated Door Contacts, Single Rotary Key Switch to accept 1 ¼" Mortise cylinder in lieu of toggle jamb mounted.	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
1	Mortise Cylinder	20-062-ICX x B520-253 –Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

.....End of Heading.....



Heading#

51

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

3	Total Openings							
1	Door#	3453	Location:	Corridor 3460	To	Pre-Screen 3453	Handing:	LH
1	Door#	3455	Location:	Corridor 3460	To	Shell-In 3455	Handing:	RH
1	Door#	3456	Location:	Corridor 3460	To	Elec 3856	Handing:	RH

Web Link

Site Verified

By Hardware Supplier					
3	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
3	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	<input type="checkbox"/>
3	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
3	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
3	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
3	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
6	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
3	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
3	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>

By Security Supplier					
3	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
3	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
3	REX Sensor	Built into lockset security to wire			<input type="checkbox"/>
3	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
3	Access Controller	To suit building system, by security provider			<input type="checkbox"/>
3	Power Supply	To suit building system, by security provider			<input type="checkbox"/>

By Owner					
3	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

.....End of Heading.....



Heading#

52

Opening Information					
Opening Type:	Single	Opening Size:	1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3468.3	Location:	WR VEST 3468	To	WR (P) 3468.3	Handing:	DA

Web Link

Site Verified

By Hardware Supplier

1	Double Acting hinge	DSH1000 x 2150	630 / US32D / Satin Stainless Steel	Markar		<input type="checkbox"/>
1	Emergency Release stop	ERS-84-C-HT-RH-NOTCH	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Storeroom Lockset	L9080T x 06B x 630 (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Mortise Cylinder	30-008 x B520-253 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Electric Strike	1500C-TORX	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Overhead Stop	105S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX(Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator	Micom Smart Swing 3 – Single Door -Security Screws (Break Away Arm) – Corridor Side Mount	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
1	Wave to lock kit	CX-WC16 - Security Screws	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent SFIC Coremax By NYGH	652 / US26D / Satin Chrome	Best		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

.....End of Heading.....



Heading#

53

Opening Information					
Opening Type:	Single	Opening Size:	1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3468.1	Location:	WR VEST 3468	To	WR (PU) 3468.1	Handing:	DA

Web Link

Site Verified

By Hardware Supplier

1	Double Acting hinge	DSH1000 x 2150	630 / US32D / Satin Stainless Steel	Markar		<input type="checkbox"/>
1	Emergency Release stop	ERS-84-C-HT-LH-NOTCH	628 / US28 / Clear Anodized	Pemko		<input type="checkbox"/>
1	Storeroom Lockset	L9080T x 06B x 630 (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Mortise Cylinder	30-008 x B520-253 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Electric Strike	1500C-TORX	630 / US32D / Satin Stainless Steel	HES		<input type="checkbox"/>
1	Overhead Stop	105S-SOC	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX(Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator	Micom Smart Swing 3 – Single Door -Security Screws (Break Away Arm) – Corridor Side Mount	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
1	Wave to lock kit	CX-WC16 - Security Screws	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>
	Emergency Call Kit	CX-WEC10K2	White	Camden		<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent SFIC Coremax By NYGH	652 / US26D / Satin Chrome	Best		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

.....End of Heading.....



Heading#

54

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3457	Location:	Corridor 3458	To	Registration 3457	Handing:	LH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

End of Heading



Heading#

55

Opening Information					
Opening Type:	Pair	Opening Size:	2-915 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3460	Location:	Corridor 3460	From	Corridor 3458	Handing:	LHRA/RHRA

Web Link

Site Verified

By Hardware Supplier

2	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
2	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec. Exit Device	RX-LX-QEL-9847EO-NL-F - LBR x 110NL-MD x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Elec. Exit Device	RX-LX-QEL-9847EO-F-LBR x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
2	Off-Set Door Pull	GSH 165 x 1500 x #2 MTG x 630	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
2	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
2	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
4	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 6330	Black	KN Crowder		<input type="checkbox"/>
1	Astragal Set	W-25 x 2150	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
2	Auto Door Bottom	CT-54 x 915	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
2	REX Sensor	To suit building system, by security provider				<input type="checkbox"/>
2	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

2	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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Notes:

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

.....End of Heading.....

Heading#

56

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3470.3	Location:	Corridor 3458	To	Corridor 3470.3	Handing:	LH

Web Link	Site Verified
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By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Passage Latchset	L9010 x 06B x 630	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>

.....End of Heading.....



Heading#

57

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3470.3A	Location:	Ambulance Vestibule 3480	To	Reporting 3470.1	Handing:	LH

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9080T x 06B x 630(Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Electric Strike	1500C	630 / US32D / Satin Stainless Steel	HES	<input type="checkbox"/>
1	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>
By Automatics Supplier					
1	Auto Operator	Micom Smart Swing 3 – Single Door – Pull Mount.	628 / US28 / Clear Anodized	MICOM	<input type="checkbox"/>
2	Wave Button	CM-331/S/W/42/SGLR	630 / US32D / Satin Stainless Steel	Camden	<input type="checkbox"/>
1	Logic Relay	CX-33		Camden	<input type="checkbox"/>
By Security Supplier					
1	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
1	REX Sensor	Built into lockset & tied into non-secure side Wave Button - security to wire			<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider			<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider			<input type="checkbox"/>
By Owner					

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

-----End of Heading-----



Heading# 58

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1220 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

3	Total Openings							
1	Door#	3463	Location:	Waiting Triage 3461	To	Assessment 3463	Handing:	RH
1	Door#	3464	Location:	Waiting Triage 3461	To	Assessment 3464	Handing:	RH
1	Door#	3465	Location:	Waiting Triage 3461	To	Assessment 3465	Handing:	RH

Web Link


Site Verified

By Hardware Supplier

3	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
3	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
3	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
3	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
3	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
3	Overhead Stop	106S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
3	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
3	Smoke/Sound Seal	W-66 x 6000	Black	KN Crowder		<input type="checkbox"/>
3	Auto Door Bottom	CT-54 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

3	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
3	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
3	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>

3	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
3	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
3	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
3	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

.....End of Heading.....



Heading#

59

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1220 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3466	Location:	Waiting Triage 3461	From	Consultation 3466	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Door Closer	4111 x PA x 689 (LCN/ST 2779	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	106S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6000	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1220	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>
By Security Supplier					
1	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire			<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider			<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider			<input type="checkbox"/>
By Owner					
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

End of Heading

Heading#

60

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1220 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

4	Total Openings							
1	Door#	3463.A	Location:	Assessment 3463	From	Corridor 3470.3	Handing:	RHR
1	Door#	3464.A	Location:	Assessment 3464	From	Corridor 3470.3	Handing:	RHR
1	Door#	3465.A	Location:	Assessment 3465	From	Corridor 3470.3	Handing:	RHR
1	Door#	3466.A	Location:	Consultation 3466	From	Corridor 3470.3	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier

4	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
4	Classroom Lockset	9070T x 06B x 630 (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
4	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
4	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
4	Overhead Stop	106S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
8	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
4	Smoke/Sound Seal	W-66 x 6000	Black	KN Crowder		<input type="checkbox"/>
4	Auto Door Bottom	CT-54 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Owner

4	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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.....End of Heading.....

Heading#

61

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3275	Location:	Corridor 3276	To	Nourish 3275	Handing:	RH

Web Link	Site Verified
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By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Privacy Latchset	LV9044 x 06B x L283-712 x L283-722 x 630	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>

.....End of Heading.....



Heading#

62

Opening Information					
Opening Type:	Single	Opening Size:	1 x 812 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3468	Location:	WR VEST. 3468	From	CLOSET 3828	Handing:	RHR

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	103S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 812	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>
By Security Supplier					
1	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire			<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider			<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider			<input type="checkbox"/>
By Owner					
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

-----End of Heading-----



Heading#

63

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1220 x 2150 x 45	STC Rating	None
Door Material:	IHMD	Frame Material:	HMF	Fire Rating	None

1	Total Openings							
1	Door#	3484	Location:	Exterior	From	Ambulance Garage 3484	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec. Exit Device	RX-LX-QEL-98EO-NL-F x 110NL-MD x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Off-Set Door Pull	GSH 165 x 1500 x #2 MTG x 630	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Door Closer	4111 x PA x 689 (LCN/ST 2779)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	106S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6000	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
1	Weather Strip	W-13 – 1 x 1220 – 2 x 2150	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
1	Threshold	CT-10 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
1	Drip Cap	W-3 x 1320	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader & Keypad	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into Exit Device - security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into Exit Device - security to wire				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>

1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

-----End of Heading-----



Heading#

64

Opening Information					
Opening Type:	Pair	Opening Size:	2-915 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	1 HR

1	Total Openings					
1	Door#	3480	Location:	Ambulance Vestibule 3480	From	Ambulance Garage 3484
					Handing:	LHRA/RHRA

Web Link



Site Verified

By Hardware Supplier

2	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
2	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec. Exit Device	RX-LX-QEL-9847EO-NL-F - LBR x 110NL-MD x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Elec. Exit Device	RX-LX-QEL-9847EO-F-LBR x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
2	Off-Set Door Pull	GSH 165 x 1500 x #2 MTG x 630	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
2	Overhead Stop	104S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
4	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 6330	Black	KN Crowder		<input type="checkbox"/>
1	Astragal Set	W-25 x 2150	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
2	Auto Door Bottom	CT-54 x 915	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator – PAIR	Micom Smart Swing 3 – Double Door – Push Mount.	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
2	Wave Button	CM-331/S/W/42/SGLR	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>

1	Logic Relay	CX-33		Camden		<input type="checkbox"/>
By Security Supplier						
1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into Exit Device & tied into non-secure side Wave Button - security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>
By Owner						
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

.....End of Heading.....



Heading#

65

Opening Information					
Opening Type:	Pair	Opening Size:	1 x 3050 x 2400	STC Rating	None
Door Material:	ALD	Frame Material:	ALF	Fire Rating	None

1	Total Openings							
1	Door#	3290	Location:	Corridor 3286	From	EMS POLICE Offload 3290	Handing:	BI-PART



By Automatics Sliding Door Supplier					
1	Automatic Sliding Door System	Micom SL800 – Complete Double Door Automatic Sliding Door System with breakout panels, sidelights, integrated Panic bars, Auto Carriage Locks, Integrated Closers, Motion Sensors, Presence Sensors, Integrated Door Contacts, Single Rotary Key Switch to accept 1 1/4" Mortise cylinder in lieu of toggle jamb mounted.	628 / US28 / Clear Anodized	MICOM	<input type="checkbox"/>
1	Mortise Cylinder	20-062-ICX x B520-253 –Const. Keying	626 / US26D / Satin Chrome	Schlage	<input type="checkbox"/>
By Security Supplier					
1	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
By Owner					
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

.....End of Heading.....



Heading#

66

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	1 HR

1	Total Openings							
1	Door#	3482	Location:	Ambulance Garage 3484	To	EMS Medication 3482	Handing:	LH

Web Link

Site Verified

By Hardware Supplier					
1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select	<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin	<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage	<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN	<input type="checkbox"/>
1	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson	<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery	<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 5400	Black	KN Crowder	<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1070	628 / US28 / Clear Anodized	KN Crowder	<input type="checkbox"/>
By Security Supplier					
1	Card Reader	To suit building system, by security provider			<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider			<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire			<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire			<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider			<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider			<input type="checkbox"/>
By Owner					
1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

End of Heading



Heading#

67A

Opening Information					
Opening Type:	Pair	Opening Size:	1 x 1200 x 2150 x 45 – 1 x 610 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	1 HR

1	Total Openings							
1	Door#	3481	Location:	Decont. Storage 3481	From	Decontam. 3326	Handing:	LHRA

Web Link

Site Verified

By Hardware Supplier

2	Continuous Hinge	SL14HD x HT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Storeroom Lockset	L9080T x 06B x 630 (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Semi-Auto Flush Bolts	FB51P	630 / US32D / Satin Stainless Steel	Ives		<input type="checkbox"/>
1	Dust Proof Strike	DP-2	630 / US32D / Satin Stainless Steel	Ives		<input type="checkbox"/>
1	Coordinator	COR52 x FL20	628 / US28 / Clear Anodized	Ives		<input type="checkbox"/>
1	Mounting Bracket	MB2	628 / US28 / Clear Anodized	Ives		<input type="checkbox"/>
2	Door Closer	4040XP x PA x (LCN/ST 2776)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	102S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
1	Overhead Stop	106S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX (Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX (Rounded Corners)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6500	Black	KN Crowder		<input type="checkbox"/>
1	Door Sweep	W-24S-SS x 1200 x TORX (Mount on Pull Side)	630 / US32D / Satin Stainless Steel	KN Crowder		<input type="checkbox"/>
1	Door Sweep	W-24S-SS x 610 x TORX (Mount on Pull Side)	630 / US32D / Satin Stainless Steel	KN Crowder		<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>
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End of Heading



Heading#

67B

Opening Information					
Opening Type:	Single	Opening Size:	1 x 1200 x 2150 x 45	STC Rating	None
Door Material:	HMD	Frame Material:	HMF	Fire Rating	1 HR

1	Total Openings							
1	Door#	3483	Location:	AMBULANCE GARAGE 3484	To	SUPPLY & CLEAN LINEN 3483	Handing:	RH

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec.Mortise Storeroom Lockset	RX-LX-L9092EU-T x 06B x 630 x 24V (Const. Keying)	630 / US32D / Satin Stainless Steel	Schlage		<input type="checkbox"/>
1	Door Closer	4011 x REG x (LCN/ST 1544)	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	106S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Kick Plates	GSH 80A – 300 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke / Sound Seal	W-66 x 6500	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1200	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Security Supplier

1	Card Reader	To suit building system, by security provider				<input type="checkbox"/>
1	Door Contact	To suit building system, by security provider				<input type="checkbox"/>
1	REX Sensor	Built into lockset security to wire				<input type="checkbox"/>
1	Latch Monitoring	Built into lockset security to wire				<input type="checkbox"/>
1	Access Controller	To suit building system, by security provider				<input type="checkbox"/>
1	Power Supply	To suit building system, by security provider				<input type="checkbox"/>

By Owner

1	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.

End of Heading



Heading#

68

Opening Information

Opening Type:	Single	Opening Size:	1 x 1070 x 2150 x 45	STC Rating	None
Door Material:	IHMD	Frame Material:	HMF	Fire Rating	3/4 HR

1 Total Openings

1	Door#	T05.1	Location:	Exterior	From	Triage Corridor T05	Handing:	RHR
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Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		X
1	Elec. Exit Device w/ Lever Trim	RX-LX-QEL-98L-F x 996L x 06 x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Mortise Cylinder	20-062-ICX x B520-253 –Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Overhead Stop	105S	630 / US32D / Satin Stainless Steel	Glynn Johnson		<input type="checkbox"/>
2	Armour Plates	GSH 90F – 864 x To Suit Door Width x TORX x 3M TAPE (Rounded Corners) (TORX TOP+SIDE ONLY)	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Smoke/Sound Seal	W-66 x 6000	Black	KN Crowder		<input type="checkbox"/>
1	Auto Door Bottom	CT-54 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
1	Weather Strip	W-13 – 1 x 1220 – 2 x 2150	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>
1	Threshold	CT-10 x 1220	628 / US28 / Clear Anodized	KN Crowder		<input type="checkbox"/>

By Automatics Supplier

1	Auto Operator	Micom Smart Swing 3 – Single Door – Push Mount.	628 / US28 / Clear Anodized	MICOM		<input type="checkbox"/>
2	Wave Button	CM-331/S/W/42/SGLR	630 / US32D / Satin Stainless Steel	Camden		<input type="checkbox"/>
1	Logic Relay	CX-33		Camden		<input type="checkbox"/>
1	Keypad	CV-110SPK				
1	Key Switch	CM-2210 x 7224 LED				

By Owner

2	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome			<input type="checkbox"/>
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SPYDER SC

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Page 87 of 89

- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider.
- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Door Can Operate in Two Modes – During Day Hours: Door is Always Open from Both Sides with Both ADO Buttons Active. During Off Hours: Closed with key from Secured Side(Cylinder) & ADO Button active only when Approved Pass Code is entered into the keypad beside it. Un-secured side always free egress with ADO Button always active. – Use Classroom Trim and Keyswitch together to Switch between Operating Modes.

-----End of Heading-----



Heading#

69

Opening Information

Opening Type:	Single	Opening Size:	1100 x 2150 x 45	STC Rating	None
Door Material:	ALD	Frame Material:	ALF	Fire Rating	None


1	Total Openings							
1	Door#	3153	Location:	EXTERIOR	From	Vestibule C-11	Handing:	LHR

Web Link

Site Verified

By Hardware Supplier

1	Continuous Hinge	SL14HD x HT x EPT x 2150	628 / US28 / Clear Anodized	Select		<input type="checkbox"/>
1	Power Transfer	EPT-10	689 / US28 / Painted Aluminum	Von Duprin		<input type="checkbox"/>
1	Elec. Exit Device	RX-LX-QEL-35A-NL-OP-F x 388NL x 4'0	630 / US32D / Satin Stainless Steel	Von Duprin		<input type="checkbox"/>
1	Rim Cylinder	20-057 – Const. Keying	626 / US26D / Satin Chrome	Schlage		<input type="checkbox"/>
1	Off-Set Door Pull	GSH 1180-3 x #2 MTG x 630	630 / US32D / Satin Stainless Steel	Gallery		<input type="checkbox"/>
1	Door Closer	4021-RH	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Drop Plate	4020-18G	689 / US28 / Painted Aluminum	LCN		<input type="checkbox"/>
1	Overhead Stop	105S x 630	689 / US28 / Painted Aluminum	Glynn Johnson		<input type="checkbox"/>
1	Door Sweep	Provided by Aluminum Door Supplier	628 / US28 / Clear Anodized			<input type="checkbox"/>

1	Weatherstrip	Provided by Aluminum Door Supplier	628 / US28 / Clear Anodized		<input type="checkbox"/>
1	Threshold	Provided by Aluminum Door Supplier	628 / US28 / Clear Anodized		<input type="checkbox"/>
By Security Supplier					
1	Door Contact	To suit building system, by security provider			
1	REX Sensor	Provided in Exit Device			
1	Latch Bolt Monitor	Provided in Exit Device			
1	Card Reader	To suit building system, by security provider			
1	Access Controller	To suit building system, by security provider			
1	Power Supply	To suit building system, by security provider			<input type="checkbox"/>
By Owner					
2	Permanent Core	Permanent FSIC by Hospital Locksmith	652 / US26D / Satin Chrome		<input type="checkbox"/>

Notes:

- 120VAC is required at the head of the door for all handicap door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes with pull cords are to be provided by the electrical contractor.
- Final commissioning of all access control items, such as but not limited to electric strikes, Rex sensors, Door contacts, Electrified Panics, Relays & Maglocks is the responsibility of the security provider

-----End of Heading-----

END OF SCHEDULE

Glass and Glazing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Glass and glazing.
- .2 Section excludes:
 - .1 Integrated blinds: in accordance with Section 08 88 61.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Show details of each type of glazing system in conjunction with the framing system indicating type of glass, sizes, shapes, glazing material and quantity. Show details indicating glazing material, glazing thickness, bite on the glass and glass edge clearance.
 - .2 Indicate analysis of glass including maximum deflection and allowable stresses from imposed dead/live loads and thermal loads.
 - .3 Submit shop drawings for digitally printed image.
- .4 Samples:
 - .1 Submit 305 mm (12") square samples of each type of glass indicated except for clear monolithic glass products, and 305 mm (12") long samples of each color required, except black, for each type of sealant or gasket exposed to view.
 - .1 Submit samples of glass showing each type of shape and finish of glass edge for exposed glass edges.
- .5 Test and evaluation reports:
 - .1 Obtain compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealant as well as other glazing materials including insulating units.
- .6 Manufacturer reports:
 - .1 Submit glass fabricator's product information and structural calculations indicating compliance with glazing standards established by the Glass Association of North America (GANA). Submittal to include thermal stress and structural load analysis of the proposed glass types, configuration and sizes.
- .7 Submit sample glazing warranty.

Glass and Glazing

- .8 Submit letter from insulating glass unit fabricator that insulating glass units supplied will bear the certification mark of IGMAC or IGCC/IGMA.

1.3 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit maintenance and cleaning instructions for glass and glazing for incorporation into the operating and maintenance manuals.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, and tempering shall be manufactured by a single manufacturer with a minimum of ten (10) years of fabrication experience and meet ANSI / ASQC 9002 1994.
 - .2 Installers / applicators / erectors:
 - .1 *Subcontractor:*
 - .1 Shall be thoroughly trained and experienced in skills required.
 - .2 Shall be completely familiar with referenced standards and requirements of the work of this section.
 - .3 Shall personally direct installation performed under this section.
 - .2 Foreperson experience: Shall have 10 years' experience, minimum, as glazing mechanic.
 - .3 Glazing mechanic experience: Shall have 3 years' experience, minimum, as glazers.
 - .4 Mirror installations: Installation only by applicator trained and approved by adhesive manufacturer for application of its products.

1.5 Delivery, Storage, and Handling

- .1 Protect glass from edge damage, dust, and contaminants during handling and storage. For insulating units exposed to substantial altitude changes, comply with insulating glass manufacturers written recommendations for venting and sealing to avoid hermetic seal ruptures.
- .2 Storage and protection: Protect glazing materials according to manufacturer's written requirements and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.

Glass and Glazing

1.6 Field Conditions

- .1 Ambient Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by the glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation or other causes.
- .2 Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 4.4°C.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 General:
 - .1 Publications: Comply with recommendations in the publications below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section.
 - .1 GANA Glazing Manual.
 - .2 GANA Engineering Standards Manual.
 - .3 GANA Laminated Glazing Reference Manual.
 - .4 GANA Sealant Manual.
- .2 Regulatory requirements:
 - .1 Fire rated glass:
 - .1 Each lite shall bear permanent, non-removable label by accredited and recognized independent testing agency certifying it for use in tested and rated fire protective assemblies.
- .3 Glass strength:
 - .1 Design glass in conformance with the building code and the following requirements:
 - .1 Minimum thickness of annealed or heat-treated glass products to be selected so the worst case probability of failure does not exceed the following:
 - .1 8 breaks per 1000 for glass installed vertically less than 15 degrees from the vertical plane and under wind action.
 - .2 Maximum lateral deflection; insulating glass units:
 - .1 For insulating glass units supported on four edges, limit centre-of-glass deflection at design wind pressure to not more than 1/175 times the long-side length or 19 mm (3/4") maximum.
 - .2 *Provide* annealed, heat strengthened, and tempered lights where required by the building code, and where required for the various solar exposures on the building.

Glass and Glazing

- .3 Glass thicknesses and glass types specified, indicated, or scheduled in the *Contract Documents* are minimums required. Modify glass thickness as required to satisfy design and building code requirements, and requirements of authorities having jurisdiction, and any such modifications shall be clearly indicated on shop drawings.
- .4 Thermal and optical performance: Provide glass products with performance properties specified or published by glass manufacturer where not specified. Performance properties to be manufacturer's published data as determined according to the following procedures:
 - .1 Centre of glass U-Value: National Fenestration Rating Council (NFRC) 100 methodology using Flixo Pro (version 8.0 or later) or LBNL WINDOW 7 computer program.
 - .2 Centre of glass solar heat gain coefficient: NFRC 200 methodology using LBNL-35298 WINDOW 5.2 computer program.
 - .3 Visible light transmittance: NFRC 200 methodology.
 - .4 Solar optical properties: NFRC 300 or LBNL Optics.
- .5 Provide glass products of uniform appearance, reflectivity, hue, shade, visible light transmittance, and colour when viewed from distance of 3 m (10 ft) to 30 m (100 ft) perpendicular to the glass or from 45 degree angle to the glass.
- .6 Protect laminated glass interlayer from damage or discolouration resulting from contact with deleterious and incompatible sealants, substances, and materials. Comply with manufacturer's recommended installation requirements.

2.2 Glass Manufacturers

- .1 Subject to compliance with the requirements of the *Contract Documents*, provide primary glass by one of the following float glass manufacturers:
 - .1 Cardinal Glass Industries.
 - .2 Guardian Industries, LLC.
 - .3 Pilkington North America.
 - .4 Vitro Architectural Glass.

2.3 Glass Materials

- .1 General:
 - .1 Single source responsibility: *Provide* materials from a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source and manufacturing plant for each type and class required.
- .2 Insulating glass units:
 - .1 Warm edge, hermetically sealed, CAN/CGSB 12.8-97 or ASTM E2190-10, minimum 12 mm (1/2") 90% argon/10% air filled cavity space, double sealed edges (primary will be polyisobutylene, secondary will be silicone, desiccant filled warm edge spacer (splice connectors at corner of each glass unit)).

Glass and Glazing

- .1 Warm edge spacer:
 - .1 Spacer Colour: Black.
 - .1 Acceptable *Products*:
 - .1 Fenzi - Chromatech Ultra Warm Edge Spacer.
 - .2 Viracon Thermal Spacer 'VTS'.
 - .3 Edgetech 'Superspacer Premium'.
 - .2 Provide a continuous ramp bead of compatible silicone sealant sloped to the exterior at the head of each vision insulating glass unit and minimum 150mm down on the sides of the unit during fabrication.
- .2 Grey coloured polyisobutylene not acceptable.
- .3 Edge delete low 'E' coating down to bare glass in accordance with manufacturer's written requirements. Deletion shall be continuous around the entire periphery of glass edges to minimum deletion width from edge of glass to at least 50% through the primary sealant bead width.
- .4 Set spacer bare evenly into glass units to maximum variation of +/- 2.0 mm (0.080")/length of spacer bar. Primary sealant shall not extend past spacer bar greater than 1.5 mm (0.060").
- .5 IGMAC or IGCC/IGMA certified, permanently marked either on spacers or on at least one component lite of units with appropriate certification label.
- .6 Low 'E' coating:
 - .1 Triple silver type, neutral appearance.
 - .2 Overall insulating glass unit performance, based on glazing unit performance without patterned glass coatings:
 - .1 SHGC 0.30 maximum.
 - .2 VLT 55% minimum.
 - .3 Basis of design: Vitro 'Solarban 70'.
- .7 Bird friendly glass:
 - .1 Acceptable *Product*:
 - .1 AviProtek Bird Friendly Glass.
- .8 Glass thickness: 6 mm (1/4") minimum and greater thicknesses as scheduled, or greater thickness as required to meet design requirements.
- .9 Glass colour: clear, unless otherwise indicated.
- .3 Annealed (float) glass:
 - .1 Clear, annealed glass, 6 mm (1/4") thick minimum, in accordance with CAN/CGSB 12.3-M91, Glazing Quality.
- .4 Heat treated (tempered or heat strengthened) float glass:
 - .1 CAN/CGSB 12.1-M90.

Glass and Glazing

- .2 Minimum thickness: 6 mm (1/4").
- .3 Fabrication process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- .4 For uncoated glass, comply with requirements for Condition A in accordance with ASTM C1048-18.
- .5 For coated vision glass, comply with requirements for Condition C (other coated glass) in accordance with ASTM C1048-18.
- .6 Heat strengthened glass shall have surface compression of 24-52 MPa (3,500-7,500 psi).
- .5 Laminated glass:
 - .1 CAN/CGSB 12.1-M90.
 - .2 Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations. Use materials that have a proven record of no tendency to bubble, discolour, or lose physical and mechanical properties after fabrication and installation.
 - .3 Glass layers minimum 5 mm (0.197") thick unless otherwise indicated.
 - .4 Interlayer thickness: Provide thickness as needed to comply with requirements and not less than the following:
 - .1 Vertical glazing: not less than 0.76 mm (0.030") unless otherwise indicated.
 - .5 Interlayer colour: Clear unless otherwise indicated.
 - .6 Glass type: annealed or heat strengthened or tempered, as required to suit design requirements.
 - .7 Laminated glass products to be fabricated free of foreign substances and air or glass pockets in autoclave with heat plus pressure.
- .6 MIR 1; Mirrors:
 - .1 In accordance with CAN/CGSB-12.5-M86.
 - .2 Mirror shall be Type 1B, edges polished, tempered.
 - .3 Size: 935 mm x 2200 mm (37" x 87").
 - .4 Thickness: 6 mm (1/4").
 - .5 Exposed edges shall be chamfered, ground, and polished.
- .7 One way mirrored glass: in accordance with ASTM C1376-15, 6 mm glass + 0.76 PVB + 6 mm glass, tempered laminated glass.
 - .1 Glass substrate: Grey.
 - .2 Visible transmittance: 11%.
 - .3 Visible reflectance, coated side: 68%.
 - .4 Visible reflectance, glass side: 16%.

Glass and Glazing

- .5 Light ratio: 8:1; subject side: observer side.
- .6 Proper glazing: mirror coating toward subject side.
- .8 Ceramic frit coated glass:
 - .1 In accordance with ASTM C1048-12e1 Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated, Condition B.
 - .2 Silk-screen pattern should be no more than 1.59 mm (0.0625") off parallel from locating glass edge and no more than 0.32 mm (0.0125") from edges other than locating glass edge.
 - .3 There shall be a maximum of a 0.79 mm (0.03125") variation in dot, hole or line location.
 - .4 Pattern and colour: to be later selection by *Consultant*.
 - .5 Acceptable manufacturers:
 - .1 Pilkington.
 - .2 Prelco.
 - .3 Viracon.
- .9 Ultraclear (Low iron) float glass:
 - .1 In accordance with ASTM C1036, Type I, Quality-Q3, Class I, complying with other requirements specified and with visible light transmission not less than 91%.
 - .2 Acceptable *Products*:
 - .1 Cardinal Glass 'Purevision'.
 - .2 Guardian 'Ultraclear'.
 - .3 Pilkington 'Optiwhite'.
 - .4 Vitro Architectural Glass 'Starphire Ultra-Clear'.
 - .5 Saint-Gobain 'Diamant'.
- .10 Integral blinds between dual glass lites: Refer to Section 08 88 61 Vision Control Glazing.
- .11 Acid etched glass:
 - .1 Tempered, acid etched on No. 1 surface to match *Consultant's* sample. Etching to be approved by *Consultant*.
- .12 Back-painted low-iron glass; BP/GL1:
 - .1 Tempered glass meeting requirements of ASTM C1048-12e1, kind HS, kind FT coated and uncoated, 6 mm (1/4") thick, minimum, epoxy opaque polyurethane coloured coating or silicone painted coating on No. 2 surface to match *Consultant's* samples.
 - .2 Colours:
 - .1 BP/GL1a: SW 0031 Dutch Tile Blue.
 - .2 BP/GL1b: SW 7732 Lemongrass (297-C7).

Glass and Glazing

.3 BP/GL1c: SW 9076 Ruby Violet (190-C4).

.13 Safety glass with digitally printed image:

- .1 Low-iron tempered and laminated glass, 12.7 mm (1/2") thick glass, with digitally printed image using digital frit technique.
- .2 Acceptable *Product*:
 - .1 Skyline Design 'Digital Glass - Layered Vines by Herman Yu'.

2.4 Glazing Materials (Non-Fire Rated)

- .1 Glazing materials; general: Select glazing sealants, tapes, gaskets and additional glazing materials of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
- .2 Glazing gaskets: Moulded or extruded gaskets of profile and hardness required to maintain watertight seal, made from the following:
 - .1 Preformed silicone to ASTM C1115-17.
- .3 Setting blocks: Moulded or extruded material with Shore, Type A Durometer hardness of 85, plus or minus 5, made from the following:
 - .1 Preformed silicone to ASTM C1115-17.
- .4 Spacers: Moulded or extruded blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated made from the following:
 - .1 Preformed silicone to ASTM C1115-17.
- .5 Edge blocks: Moulded or extruded material of hardness needed to limit glass lateral movement (side walking) made from the following:
 - .1 Preformed silicone to ASTM C1115-17.
- .6 Cleaners, primers and sealers: Type recommended by sealant or gasket manufacturer.
- .7 Polyurethane foam glazing tape:
 - .1 High density, closed-cell, flexible, non-extruding tape, adhesive backed one side only; recommended by manufacturer for exterior applications with nominal pressure in glazing channel.
 - .2 Acceptable *Products*: As recommended by manufacturer suitable for conditions of application and use.
- .8 Silicone glazing (Weatherseal) sealant:
 - .1 Non-staining, low dirt pick-up, medium-modulus, neutral-curing silicone sealant; complying with ASTM C920-11, Type M or S, Grade NS, Class 50.
 - .2 SWRI Validation.
 - .3 Colour: to later selection by *Consultant* from full range.
- .9 Mirror clip:

Glass and Glazing

- .1 Acceptable *Product*:
 - .1 CRL 'Satin Anodized 1/4" Deep Nose Aluminum J-Channel, Model D636P'.
- .10 Mirror adhesive:
 - .1 Acceptable *Product*:
 - .1 Palmer 'Mirro-Mastic', complete with sealer as required.
- .11 Silicone glazing (Weatherseal) sealant:
 - .1 Non-staining, low dirt pick-up, medium-modulus, neutral-curing silicone sealant; complying with ASTM C920-11, Type M or S, Grade NS, Class 50.
 - .2 SWRI Validation.
 - .3 Colour: to later selection by *Consultant* from full range.
- .12 Butt glazing joint sealant:
 - .1 Medium-modulus, neutral-curing silicone sealant; complying with ASTM C920-11, Type S, Grade NS, Application G, Class 25.
 - .2 Colour: as selected by *Consultant* from full colour range.
 - .3 Acceptable *Products*:
 - .1 DOWSIL '999-A'.
 - .2 Mumentive 'SCS1200'.
 - .3 Pecora '860'.
 - .4 Tremco 'Proglaze'.

2.5 Fabrication of Glazing Units

- .1 Fabricate glazing units in sizes required to fit openings, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - .1 Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
- .2 Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- .3 Grind smooth and chamfer, and polish exposed glass edges and corners, unless otherwise indicated.

PART 3 - EXECUTION

3.1 Examination

- .1 Examine framing, glazing channels, and stops, with glazing installer present, for compliance with the following:

Glass and Glazing

- .1 Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - .2 Inspect butt and mitre joints in framing. Seal joints found to be open with a compatible sealant prior to glazing.
 - .3 Glazing pockets and surfaces are free of dust, construction debris, and contaminants.
 - .4 Presence and functioning of weep systems.
 - .5 Minimum required face and edge clearances as per FGIA and GANA standards.
 - .6 Effective sealing between joints of glass-framing members.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

- .1 Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- .2 Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.
- .3 Clean contact surfaces with solvent and apply primers to surfaces to receive tapes and sealants in accordance with the manufacturer's requirements. Ensure surfaces are free of moisture and frost.

3.3 Glazing - General

- .1 Comply with combined written requirements of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- .2 Adjust glazing channel dimensions as required by conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- .3 Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- .4 Clean glazing rebate surfaces of traces of dirt, dust, or other contaminants.
- .5 Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- .6 Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- .7 Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- .8 Provide spacers for glass lites where length plus width is greater than 1270 mm (50").

Glass and Glazing

- .1 Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
- .2 Provide 3.2 mm (1/8") minimum bite of spacers on glass and use thickness equal to sealant width.
- .9 Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel.
- .10 Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- .11 Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- .12 Glaze hollow metal doors and frames specified under work of Section 08 11 13 using tape glazing installation.
- .13 Install fire rated glazing in accordance with fire rated glazing *Product* manufacturer's written requirements and with current fire-resistance listing for each *Product*. Field cutting or tampering is not permissible.

3.4 Tape Glazing

- .1 Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- .2 Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- .3 Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- .4 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- .5 Do not remove release paper from tape until right before each glazing unit is installed.
- .6 Centre glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centres of openings.

3.5 Gasket Glazing (Dry)

- .1 Allow gaskets to relax and cut compression gaskets to lengths recommended by gasket manufacturer to fit openings to suit frame dimensions.
- .2 Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

Glass and Glazing

- .3 Installation with drive-in wedge gaskets: Centre glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centres of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- .4 Installation with Pressure-Glazing Stops: Centre glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- .5 Install gaskets so they protrude past face of glazing stops.

3.6 Sealant Glazing (Wet)

- .1 Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- .2 Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- .3 Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 Installation - Mirrors

- .1 *Provide* frameless mirrors only. Grind and polish exposed mirror edges.
- .2 Mount mirrors in true planes, free of distortions. Surfaces of butted mirrors shall be flush to $\leq 1 \text{ mm}$ (0.04"). Mirror installation shall be flat to within 1.5 mm in 1220 mm (1/16" in 4 ft).
- .3 Locate joints in mirrors at maximum available mirror sizes to *Consultant's* direction, unless otherwise indicated. *Provide* butt joints with flat ground and polished edges to provide inconspicuous joint complete with black tape behind joint to hide wall substrate.
- .4 Mastic adhesive and top and bottom support clip installation:
 - .1 Secure mirrors in place over mastic adhesive with metal clips. Locate clips at not more than 914 mm (36") on centre on top and bottom edges of mirrors.
 - .2 Make sure mirror and substrate are free of dust, clean, and dry. On nonporous substrates, such as glass, tile, or metal, sealing is not necessary. On porous substrates, such as drywall or wood, use Mirro-Mastic Bond (or a primer or sealer, not paint) on the substrates and allow it to dry. Painted surfaces should be sanded through to the original surface and the substrate cleaned and sealed where the mastic is to be applied.
 - .3 Support mirror at the bottom using concealed bottom angles.

Glass and Glazing

- .4 Apply mirror adhesive to the mirror or substrate in a minimum of 1 ping-pong ball size mound for every 0.0929 m² (1 ft²) of mirror. Do not apply mastic too close to the edge to prevent "squeeze out". Place the mounds so space will be left between them when the mirror is installed. Mastic adhesive shall be at room temperature (22°C (72°F)).
- .5 Press mirror firmly in place making good contact between the mirror, mastic, and substrate. Mastic should spread to a pat approximately 114 mm (4-1/2") in diameter. The mastic needs air circulation to cure properly. Curing time will depend on temperature, humidity, type of substrate, and amount of air that can reach the mastic.
- .5 Mastic adhesive and bottom trim support installation:
 - .1 Mirror substrate shall be free of dust, clean, and dry. On nonporous substrates, such as glass, tile, or metal, sealing is not necessary. On porous substrates, such as drywall or wood, use Mirro-Mastic Bond on the substrates and allow it to dry.
 - .2 Support mirror at the bottom aluminum trim and shim at ¼ points with concealed setting blocks.
 - .3 Apply mirror adhesive to the mirror or substrate in a minimum of 1 ping-pong ball size mound for every 0.0929 m² (1 ft²) of mirror. Do not apply mastic too close to the edge to prevent "squeeze out".
 - .4 Place the mounds so space will be left between them when the mirror is installed. Mastic adhesive shall be at room temperature (22°C (72°F)).
 - .5 Press mirror firmly in place making good contact between the mirror, mastic, and substrate.
 - .6 Mastic should spread to a pat approximately 114 mm (4-1/2") in diameter. The mastic needs air circulation to cure properly.
 - .7 Curing time will depend on temperature, humidity, type of substrate, and amount of air that can reach the mastic.

3.8 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Performing random testing on:
 - .1 Argon gas concentration within insulating glass units.
 - .2 Surface compression tests on heat strengthened and tempered glass.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.9 Adjusting and Cleaning

- .1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.
- .2 Final cleaning of glass in accordance with Section 01 77 00.

Glass and Glazing

END OF SECTION

Vision Control Glazing

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Manual and motorized vision control glazing with integral blinds including:
 - .1 Behavioral/Mental Health (MH) impact resistant vision control glazing.
 - .2 Fire resistive rated vision control glazing (FR).
 - .2 Refer to schedule of vision control glazing types included in this section.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .2 Include details of each vision control unit and frame type, finish hardware types and locations, frame profiles, elevations, mitre details, glazing preparation details and anchor details, and locations.
 - .3 Include schedule identifying each unit, with vision control unit marks and numbers relating to numbering on drawings and schedule.
 - .4 Indicate impact-safety ratings for each glass type for design and performance requirements.
 - .5 Motorized electrified hardware requirements and preparations shall be clearly indicated on shop drawings.
- .4 Samples:
 - .1 Submit 305 mm (12") square vision control unit for each type indicated in this section. Each type shall include hardware, integral blinds and hardware to demonstrate operation.
- .5 Fire rated and impact resistant vision control units test and evaluation reports:
 - .1 Submit certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials to be *Provided* in the *Work* comply with the design and performance requirements given in the *Contract Documents*.

Vision Control Glazing

- .2 Certificate shall include verification of testing by an independent testing laboratory acceptable to authorities having jurisdiction.
- .3 At the discretion of the *Consultant* and authorities having jurisdiction, separate certification may not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided such labels represent that the manufacturer has in place a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Maintenance data:
 - .1 Submit maintenance data for incorporation into operations and maintenance manuals.

1.5 Quality Assurance

- .1 Manufacturers:
 - .1 Company specializing in performing the work of this section with 10 years' documented experience, minimum, including successful completion of work of similar size and character.
- .2 Installer:
 - .1 Company:
 - .1 Authorized by the manufacturer for the installation of their systems.
 - .2 Submit a letter signed by representative of vision control glazing manufacturer with company's authorization stating that installer is acceptable and qualified to install system.
 - .2 Foreperson experience: Shall have 10 years' experience, minimum, as glazing mechanic.
 - .3 Typical glazing mechanic experience: Shall have 3 years' experience, minimum, as glazers.
- .3 Mock-up:
 - .1 *Provide* sample installation of vision control glazing assembly for each type complete with finishes, hardware, and sealants for review by *Consultant* before proceeding with the remainder of the installation. Location and size of sample installation(s) shall be as directed by *Consultant*. Acceptance of workmanship and performance shall establish basis for acceptance of remainder of the work of this section.
 - .2 If possible, mock-up may become part of finished work, at sole discretion, and with prior written acceptance of *Consultant*.

Vision Control Glazing

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design glass, glazing, framing system, and accessories to comply with performance/design requirements specified below in Section 08 11 14.
- .2 Assemblies shall be factory-welded or come complete with factory-installed mechanical joints and shall not require fabrication at the *Place of the Work*.
- .3 Assemblies shall bear permanent, non-removable label certifying it for use in tested and rated fire-protective and fire-resistive assemblies.
- .4 Rated window (fixed glazing) assemblies (FR); in accordance with listing and as follows:
 - .1 Tested to CAN/ULC-S106-15 and listed by a nationally recognized agency having a factory inspection service and shall be constructed as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .5 Behavioral Health/Mental Health Impact-Rated Vision Control Glass Units (MH): Certified to AAMA 501.8 for 2000 foot-pound human impact resistance.
- .6 Minimum Impact Safety Resistance unless otherwise noted: in accordance with CAN/CGSB 12.1-M90.

2.2 Manufacturer's System

- .1 Basis of design:
 - .1 Unicel 'Vision Control'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.3 Materials

- .1 Framing system and integral louvers:
 - .1 Basis of design manufacturer's framing, louvres and mechanical fasteners.
- .2 Glass and glazing: in accordance with Section 08 80 00, and as follows:
 - .1 Clear Tempered Glass:
 - .1 Type: ASTM C1048, Type 1 transparent flat, Class 2 tinted heat absorbing and light reducing, Quality q3 glazing select, Kind FT fully tempered.
 - .2 Laminated Glass: Comply with ASTM C1172 and ANSI Z97.1.
 - .3 Fire resistive glazing:
 - .1 Fire-rated, impact safety-rated, and fire resistive glazing, clear laminated or tempered high visible light transmission glass laminated with an intumescent interlayer. Minimum thickness to meet fire rating as indicated.
 - .1 Acceptable *Products*:
 - .1 Technical Glass Products 'Pilkington Pyrostop'.

Vision Control Glazing

- .4 Polycarbonate Sheet:
 - .1 Type: ANSI Z97.1; plastic compound, ultraviolet stabilized, non-yellowing, abrasion resistant coated.
 - .2 Colour: Clear.
- .5 Glazing accessories:
 - .1 Glazing tape:
 - .1 Closed cell polyvinyl chloride (PVC) foam, type as *Provided* by glazing manufacturer, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapour seal.
 - .2 Silicone fabrication sealant: Types as recommended by glazing manufacturer, including fire-rated silicone sealants at perimeter joints, gray colour.
 - .3 Silicone sealant: type as recommended by glazing manufacturer.
 - .4 Setting blocks: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.
 - .5 Cleaners, primers, and sealers: Type recommended by manufacturer of glass and gaskets.
 - .6 Glazing stops: Aluminum, base and snap-on on both sides by Unicel Architectural.
 - .1 Finish: to later selection by *Consultant*.
- .3 Manual Operator:
 - .1 Removable key operator.
- .4 Electric Operators:
 - .1 Motor voltage, motor type, and hardware as determined by manufacturer based on glass opening sizes and number of glass panels per motor.
 - .1 Controls: Full span rotation type. wall switch at nurse bench.
- .5 Joint sealants: in accordance with manufacturer's written requirements.
- .6 Butt-joint sealant: type as recommended by manufacturer.

2.4 Finishes – Aluminum

- .1 Exposed aluminum surfaces: thermosetting acrylic enamel to AAMA 2603-17a, 0.8 mils minimum overall dry film thickness.
 - .1 Acceptable *Products*:
 - .1 PPG 'Duracron'
 - .2 Colour: K-1285 Glossy White.

Vision Control Glazing

2.5 Fabrication - General

- .1 Fabricate glass, and sealed insulated glass units in accordance with section 08 80 00 – Glass and Glazing.
- .2 Fabricate vision control glazing units to the design and dimensions indicated. Take field measurements where coordination with adjoining work is necessary.
- .3 Fabricate to be rigid, neat in appearance and free from defects, warp, wave or buckle with all corners square unless otherwise indicated.
- .4 Countersink exposed fasteners unless otherwise shown. Use flat or oval head screws.
- .5 Allow for anticipated expansion and contraction of frames and supports.
- .6 Fit elements at intersections and joints accurately together, in true planes, and plumb and level.
- .7 Touch up finish damaged during fabrication.
- .8 Attach to suit required fire ratings.
- .9 Motor operated preparation:
 - .1 Coordinate control requirements and electrical connection boxes supplied by Divisions 26, 27, and 28 for installation into frame by work of this section.

PART 3 - EXECUTION

3.1 Examination

- .1 *Provide* necessary grounds, bracing and strapping for fitting and adequate for securing of the work.
- .2 Cooperate with work of other sections to ensure fastenings set by others are provided and located, their work is installed to their specifications and that those responsible for back priming are notified in sufficient time for them to schedule work.

3.2 Installation

- .1 Install in accordance with manufacturer's written requirements and reviewed shop drawings.
- .2 Frame installation tolerances:
 - .1 Plumbness tolerance, measured through a line from the intersecting corner of vertical members and the head to the floor, shall be ± 1.6 mm ($\pm 1/16$ ").
 - .2 Squareness tolerance, measured through a line 90° from one jamb at the upper corner of the product, to the opposite jamb, shall be ± 1.6 mm ($\pm 1/16$ ").
 - .3 Alignment tolerance, measured on jambs, through a horizontal line parallel to the plane of the wall, shall be ± 1.6 mm ($\pm 1/16$ ").
 - .4 Twist tolerance, measured at face corners of jambs, on parallel lines perpendicular to the plane of the wall, shall be ± 1.6 mm ($\pm 1/16$ ").

Vision Control Glazing

- .3 Brace frame product rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install temporary wood spreaders at mid-point of frame rabbet height to maintain frame widths. Remove wood spreaders after product has been built-in.
- .4 Secure anchorages and connections to adjacent construction.

3.3 Glass and Glazing

- .1 Install fire rated glazing in accordance with fire rated glazing material manufacturer's specifications.
- .2 Install glass for work of this section to requirements herein and in accordance with Section 08 80 00, and assume total responsibility for sizing, design and other aspects of glass work and accessories.

3.4 Installation - Sealant

- .1 *Provide* sealants following the installation procedures specified in Section 07 92 00, and in accordance with sealant manufacturer's and vision control glazing manufacturer's written requirements.

3.5 Adjusting and Cleaning

- .1 Verify that installed vision control glazing system functions properly, and adjust it accordingly to ensure satisfactory operation.
- .2 Refinish damaged or defective work so that no variation in surface appearance is discernible.

3.6 Closeout Activities

- .1 Demonstration:
 - .1 Before acceptance of system, arrange for demonstration of equipment with authorized representatives of *Owner*, to be performed by representative of vision control glazing manufacturer to assure proper function, operation and explanation.
 - .2 Conduct comprehensive demonstration for *Owner's* staff on operation and care of vision control glazing.

3.7 Schedule of Vision Control Glazing

- .1 VS-#:
 - .1 Vision glass types:
 - .1 GL5 manual.
 - .2 GL5M motorized.
 - .2 Impact resistance: 400 lb.
 - .3 Fire Rating: 45 min.

END OF SECTION

Metal Supports for Gypsum and Cement Board

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Metal support systems for interior gypsum and cement board partitions, interior ceilings, shaftwalls and interior assemblies as indicated.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the *Work* of this section, including additional data as may be required to demonstrate compliance with the *Contract Documents*.
- .3 Shop drawings; for engineered interior metal blocking support systems:
 - .1 Shop drawings shall be engineered.
 - .2 Seismic connections and restraint of wall and ceiling systems.
 - .3 Submit design for metal support systems at interior locations where noted as engineered.
- .4 Shop drawings; for engineered shaftwalls:
 - .1 Shop drawings shall be engineered.
 - .2 Seismic connections and restraint of wall and ceiling systems.
 - .3 Submit design for metal support systems at interior locations where noted as engineered.
 - .4 Submit written confirmation and design for shaftwall construction showing adequacy of system in meeting fire ratings and its ability to withstand pressures and deflections that may occur in high velocity duct shafts. Shaftwall design shall be prepared as an engineered shop drawing.
- .5 Test and evaluation reports:
 - .1 Submit certified test results for each required fire resistance rated assembly for work of this section.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:
 - .1 *Subcontractor*. Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

Metal Supports for Gypsum and Cement Board

PART 2 - PRODUCTS

2.1 Performance/Design Requirements - Engineered Interior Metal Support Systems

- .1 Design system members to withstand own dead load, super-imposed dead loads, to maximum allowable deflection of $L/240$, without permanent deformation.
- .2 Loads on walls acting as guards: Where the floor elevation on one side of a wall, including a shaftwall, is more than 600 mm (24") higher than the elevation of the floor or ground on the other side, the wall shall be designed to resist the lateral design loads prescribed in the building code or 0.5 kPa (0.07 PSI), whichever produces the greatest effect.
- .3 The average weight of the ductwork components, including vav boxes, has been estimated at 34 kg/m^2 (7 lbs/ft²), translating into an average estimated point load of 95.25 kg (210 lb) per rod, or 190.50 kg (420 lb) every 3000 mm (10 ft).
- .4 Design metal support system to allow for an upper acoustic ceiling space between 300 mm (12") and 500 mm (19") clear from the underside of the slab and the top of the framing.
- .5 Seismic design: Design and install suspended ceiling system to withstand the effects of earthquake motions in accordance with ASTM E580/E580M-22.
- .6 Seismic design requirements for partition and ceiling assemblies shall comply with building code requirements.

2.2 Performance/Design Requirements - Shaftwall System Description

- .1 Gypsum board shaft systems include special purpose assemblies of gypsum boards and metal components designed for erection entirely from room side of shaft (except for application of finish layer on shaft side, where required to form an enclosure).
- .2 *Provide* gypsum board shaft systems designed and tested by manufacturer to withstand lateral design loading (air pressure) of 48 kg/m^2 (10 lb/ft²), applied transiently and cyclically, for maximum heights of partitions required, within deflection limit of $1/240$ of partition height and in stairways.
- .3 *Provide* drywall shaft systems designed and tested by manufacturer to achieve a minimum STC rating of 35 in accordance with ASTM E90-09.

2.3 Performance/Design Requirements - Fire Resistance Rated Assemblies

- .1 Where gypsum board systems with fire resistance ratings are indicated or required, provide materials and installations that are identical with those of applicable assemblies tested by fire testing laboratories acceptable to authorities having jurisdiction.

2.4 Materials - General

- .1 For sheet metal *Products*: Sheet metal thickness indicated herein pertains to the minimum base steel thickness exclusive of coating.
- .2 Protective coatings for metal supports and framing:
 - .1 Minimum corrosion protection: Z120 (G40) ASTM A653/A653M-13.

Metal Supports for Gypsum and Cement Board

- .3 Sheet metal screws shall have a minimum coating thickness of 0.008 mm (0.0003") of zinc. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of *Consultant*.
- .4 Screws:
 - .1 Steel screws shall be equal to or exceed minimum diameter indicated on shop drawings.
 - .2 Penetration beyond joined materials shall be not less than 3 exposed threads.
 - .3 Thread types and drilling capability shall conform to manufacturer's recommendations.

2.5 Partition Support Materials

- .1 Interior non-loadbearing channel stud framing: to ASTM C645-18; roll formed from 0.455 mm (0.0179") minimum thickness unless otherwise indicated or as recommended by gypsum board manufacturer, galvanized steel sheet. Provide service holes starting at 450 mm (18") from bottom, then 914 mm (36") on centre to top of studs.
 - .1 Steel studs at door jambs and where indicated: 1.720 mm (0.0677") minimum thickness.
 - .2 Steel studs; at backer plate locations: 0.836 mm (0.0329") (18 gauge) minimum thickness.
 - .3 Steel studs at abuse resistant gypsum board locations: 1.214 mm (0.0478") (18 gauge) minimum thickness.
 - .4 Steel studs at impact resistant gypsum board locations: 1.214 mm (0.0478") (18 gauge) minimum thickness.
 - .5 Steel studs at tile backer board locations: 0.836 mm (0.0329") minimum locations.
- .2 Interior engineered metal stud framing: to ASTM C645-18; as indicated; roll formed from 0.836 mm (0.0329") minimum thickness unless otherwise required, galvanized steel sheet. Provide service holes starting at 450 mm (18") from bottom, then 914 mm (36") on centre to top of studs.
- .3 Interior floor and ceiling tracks (runners): to ASTM C645-18; in widths to suit stud sizes.
 - .1 Metal thickness: to match studs.
 - .2 For openings wider than 914 mm (36"), provide 0.836 mm (0.0329") minimum thickness for header.
- .4 Deflection track; for non-fire-rated assemblies: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in metal thickness not less than indicated for studs and in width to accommodate depth of studs.
- .5 Interior floor and ceiling track (runner) fasteners:
 - .1 To concrete and masonry: Use stub nails or power-driven fasteners.
 - .1 Power actuated fastening systems are not permitted.

Metal Supports for Gypsum and Cement Board

- .2 To suspended acoustic ceiling tile grid: Manufactured to fit applicable ceiling grid profile; CGC 'Partition Clip'.
- .6 Bracing channels: Minimum 19 mm x 10 mm x 1.087 mm (3/4" x 3/8" x 0.0428") cold rolled galvanized steel.

2.6 Ceiling Support Materials and Systems

- .1 General: Size ceiling support components to comply with ASTM C754-20 unless otherwise indicated, and as required for seismic design, connections and restraint of wall and ceiling assemblies.
- .2 Main runners: Steel channels, hot or cold rolled; Z180 (G60) galvanized.
- .3 Hanger wire: in accordance with ASTM A641/A641M-19, soft, Class 1 galvanized, minimum 4.064 mm (0.160", 8 AWG).
- .4 Hanger rods and flats: Mild steel with zinc coating, galvanized for exterior applications.
 - .1 General: Size devices for load imposed by completed system as determined in accordance with ASTM E488/E488M-22 and as required for seismic loading and restraint in accordance with engineered shop drawings.
 - .2 Screws, clips, bolts, concrete inserts or other devices for ceiling hangers whose suitability for use intended has been proven through standard construction practices or by certified test data.
 - .3 Hangers: Comply with ASTM C754-20 for maximum ceiling area and loads to be supported.
 - .4 Interior concrete ceiling anchors:
 - .1 *Acceptable Products:*
 - .1 ITW Ramset/Red Head 'Dynabolt Sleeve Anchor TW-1614' or 'Redi-Drive Tie Drive' or 'Redi-Drive' with angle clip.
 - .2 ITW Ramset/Red Head 'Trubolt' or 'Dynabolt' anchors complete with galvanized angle clip.
 - .3 Hilti 'Kwik-Bolt 3' and 'HHDCA 1/4 Ceiling Hangers'.
 - .5 Fasteners exposed to weather, condensation, and corrosion: Zinc-plated or stainless steel fasteners in applicable product lines specified in preceding paragraphs.
- .5 Tie wire: 1.19 mm (0.047", 18 AWG) minimum zinc coated, soft-annealed wire, to ASTM A641/A641M-19.
- .6 Furring anchorages: 1.62 mm (0.0637", 16 AWG) galvanized wire ties, manufacturer's standard wire type clips, bolts, nails or screws as recommended by furring manufacturer and complying with ASTM C754-20.
- .7 Runner (carry) channels: 1.367 mm (0.0538") thick cold rolled steel, primer painted or zinc coated for interior locations, to ASTM C754-20, with minimum 228 MPa yield strength:
 - .1 38 mm x 12.7 mm (1-1/2" x 1/2") where supported at centres of 914 mm (36") maximum.

Metal Supports for Gypsum and Cement Board

- .2 38 mm x 19 mm (1-1/2" x 3/4") where supported at centres of 1220 mm (48") maximum.
- .8 Provide compression posts and other system components as required for seismic anchorage, connections and restraint.

2.7 Furring

- .1 Furring channels: 0.836 mm (0.0329") minimum typical thickness, cold rolled steel, wiped coated, nominal size of 22 mm (7/8") depth x 35 mm (1-3/8") face, hat type with knurled face.
- .2 Resilient furring channels:
 - .1 Acceptable *Product*:
 - .1 Bailey Metal 'Resilient Channel'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .3 Z-furring members: Galvanized steel z-shaped furring members; ASTM A653/A653M-13, G60, 0.836 mm (0.0329") minimum thickness of base metal, of depth indicated, designed for mechanical attachment of insulation boards or blankets.
 - .4 Fasteners for furring members: Type and size recommended by furring manufacturer for substrate and application indicated, corrosion resistant finish for exterior building envelope applications, load rating and spacing to support materials carried by assembly as required for seismic loading and restraint in accordance with engineered shop drawings.

2.8 Shaftwall

- .1 Shaftwall studs and accessories: 0.836 mm (0.0329"), rolled galvanized steel sheet fabricated specially for gypsum coreboard and facing boards.
- .2 Provide manufacturer's standard shapes for shaftwall construction; of profile, size and base metal thickness designed to comply with AISI "Specification for Design of Cold Formed Steel Structural Members" for structural performance characteristics indicated. Fabricate from steel sheet complying with ASTM A653/A653M-13, Grade A or B, for structural performance of base metal, as well as with ASTM A653/A653M-13, G60, for hot dip galvanized products, and ASTM A463/A463M-22 for aluminized *Products*.

2.9 Accessories

- .1 Backer plates:
 - .1 Metal backer plates: Steel, galvanized; minimum 150 mm (6") wide x 0.836 mm (0.0329") minimum x length and width to suit size of items to be attached; fastened to studs for attachment of surface mounted fittings and accessories.
 - .2 Elimination of backer plates or direct attachment of accessories or equipment to studs will not be permitted.

Metal Supports for Gypsum and Cement Board

PART 3 - EXECUTION

3.1 Installation General

- .1 Comply with ASTM C754-20 and manufacturer's requirements, except as modified herein. Do not bridge building expansion joints with support system. Frame both sides of joints with furring and other supports as indicated.
- .2 Provide and install studs, framing, shimming, and furring to provide proper support for gypsum board to achieve the following installation tolerances:
 - .1 Do not exceed 3 mm (1/8") in 3 m (10') variation from plumb, level, and plane.
 - .2 Do not exceed 10 mm (3/8") from drawings locations.
 - .3 Do not exceed 1.5 mm (1/16") variation between planes of abutting edges or ends.
 - .4 Install each framing member so fastening surfaces vary not more than 3.2 mm (1/8") from the plane formed by faces of adjacent framing.
 - .5 In double stud walls, do not bridge across studs on opposite sides of wall with gypsum board or metal cross bracing.
- .3 Give complete cooperation and direction to trades erecting framing and furring over which this work is applied. Coordinate finished joint location with framing.
- .4 Coordinate installation and cooperate with mechanical and electrical work to accommodate mechanical electrical items and any other work required to be incorporated into or coordinated with the partitions, ceiling and soffit systems.
 - .1 Where the presence of suspended ductwork or other mechanical or electrical services or devices above ceiling framing conflicts with ceiling framing suspension points from structure above, provide bridging framing below conflicting work as required to support ceiling framing on specified intervals.
 - .2 Do not suspend ceiling framing from mechanical or electrical suspension systems unless agreement is obtained in writing from engineer for *Subcontractor* installing such framing that additional imposed loads are acceptable; obtain *Consultant's* acceptance before proceeding.
- .5 Provide clearances between work of this section and structural elements to prevent transference of structural loads.
- .6 Do not bridge building expansion joints with steel framing or furring members. Independently frame both sides of joints with framing of furring members or as indicated.
- .7 Size framing systems according to manufacturer's engineered load tables, to meet allowable deflection without permanent deformation.
 - .1 Maximum allowable deflection: L/240.
 - .2 Maximum allowable deflection for tiled partitions: L/360.

3.2 Blocking

- .1 Attach to framing adequate backer plates to support the load of, and to withstand the withdrawal and shear forces imposed by, items installed upon the work of this section.

Metal Supports for Gypsum and Cement Board

3.3 Furring - General

- .1 Furring indicated in *Contract Documents* is schematic. Do not regard as exact or complete. *Provide* all necessary framing and furring to support gypsum board in accordance with manufacturers' specifications.
- .2 Shim furring as required to achieve required installation tolerances.
- .3 Leave finished work rigid, secure, square, level, plumb, curved to detailed radius and erected to maintain finish gypsum board line dimensions and contours. Make allowance for thermal movement.
- .4 Thermally separate metal studs from exterior concrete or masonry.

3.4 Suspended and Furred Ceilings

- .1 Arrange hangers for suspended gypsum board ceilings to provide support independent of walls, columns, pipes, ducts; erect plumb, and securely anchored to structural frame, or embed in concrete slabs.
- .2 Keep lateral braces at hangers back 450 mm (18") minimum unless otherwise noted.
- .3 Space hangers at 914 mm (36") on centre maximum along runner channels, and not more than 150 mm (6") from ends.
- .4 Space runner channels at 1220 mm (48") on centre, maximum, and not more than 150 mm (6") from boundary walls, interruptions of continuity, and changes in direction. Run channels transversely to structural framing members.
- .5 Where splices are necessary, lap members at least 200 mm (8") and wire each end with 2 loops. Avoid clustering or lining up of splices.
- .6 Attach to rod hangers by bending hanger sharply under bottom flange of runner, and securely wiring in place with saddle tie.
- .7 Erect cross furring channels transversely across runner channels at 400 mm (16") on centre maximum, 305 mm (12") on centre at fire rated assemblies, at not more than 150 mm (6") from boundary wall openings, interruptions in ceiling continuity, and changes in direction.
- .8 Secure furring channels to each support with purpose-made slips or wire tie. Splice joints by lapping channels and tying together.
- .9 Level cross furring channels to maximum tolerance of 3 mm in 3 m (1/8" in 10 ft).

3.5 Wall Furring

- .1 Install steel furring for braced walls, free standing walls, walls that are furred out as indicated.
- .2 Frame openings and around built-in equipment, cabinets, access panels, on 4 sides, with channels. Extend furring into reveals. Check clearances with equipment suppliers.
- .3 *Provide* bulkheads and boxed-in duct shafts, for beams, columns, pipes and around exposed services where indicated. Install 19 mm (3/4") channels at corners and at 305 mm (12") on centre.

Metal Supports for Gypsum and Cement Board

3.6 Resilient Furring

- .1 Ceilings:
 - .1 Fasten the resilient furring perpendicular to the ceiling framing every 305 mm (12").
 - .2 Fasten the first furring member 150 mm (6") from the wall.
 - .3 Fasten the second furring member 305 mm (12") from the same wall.
 - .4 Fasten the last furring member 150 mm (6") from the opposite wall.
- .2 Partitions:
 - .1 Install resilient furring with outer leg oriented upward.
 - .2 Fasten the resilient furring maximum 610 mm (24") on centre.
 - .3 Fasten the first furring member 50 mm (2") from the floor. Install 150 mm (6") continuous strip of 12.7 mm (1/2") gypsum board along base of partitions where resilient furring installed.
 - .4 Fasten the second furring member 610 mm (24") from the floor.
 - .5 Fasten the last furring member 150 mm (6") from the ceiling.
- .3 Secure to each support with 25 mm (1") gypsum wallboard screw.
- .4 *Provide* resilient furring channel transverse to framing members, or as indicated.

3.7 Metal Stud Partition Framing

- .1 Provide partition tracks (runners) at floor and underside of structural assembly and as follows:
 - .1 Align accurately and lay out according to partition layout.
 - .2 Secure runners to concrete, access flooring and to concrete slabs, as applicable, with screwed or shot fasteners located 50 mm (2") from each end and spaced at maximum 610 mm (24") on centre.
 - .3 At partition corners, extend one runner to end of corner and butt other runner to it, allowing necessary clearance for gypsum board thickness. Runners should not be mitred.
- .2 Unless otherwise indicated, place interior studs vertically at centres as follows:
 - .1 *Provide* studs at 400 mm (16") on centre, and as specially spaced in accordance with details indicated.
 - .2 *Provide* studs not more than 50 mm (2") from abutting walls, openings and each side of corners.
 - .3 *Provide* freedom for 19 mm (3/4") deflection under beams, structural slabs and the like to avoid transmission of structural loads to studs, or install 50 mm (2") leg ceiling tracks.
- .3 Install studs in tracks at floor and ceiling.

Metal Supports for Gypsum and Cement Board

- .4 Where horizontal runs of service lines are scheduled to be installed, arrange with applicable trades and install studs simultaneously with services.
- .5 At openings in stud walls, erect track at head and sills to accommodate intermediate studs. At each end of track, cut out flanges, turn up web, and fasten to studs. Install intermediate studs above and below openings in same manner and spacing as wall studs. Install double studs at each jamb, and double tracks at head of door openings.
- .6 At partitions requiring fire rating, erect in accordance with requirements of listing.
- .7 Size studs, connections, and runners to carry loads according to stud manufacturer's load tables, at 24 kg/m² (5 lb/ft²) live load to meet maximum allowable deflection limits. Where depth of stud is indicated, size metal thickness to meet allowable deflection limits.
- .8 *Provide* three studs at corner and intermediate intersections of partitions.
- .9 Coordinate work with others installing horizontal runs of service lines so that work is done simultaneously. Where standard holes are too small for installed services, notch studs, and splice notched flanges with splice pieces 305 mm (12") longer than notches, each fastened with 2 screws.
- .10 Coordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .11 Coordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other sections.
- .12 Unless otherwise indicated, partitions, together with gypsum board facings, shall extend above ceilings to underside of structure above.
- .13 Chase walls:
 - .1 *Provide* chase walls consisting of two parallel steel stud partitions.
 - .2 *Provide* cross bracing consisting of metal furring, located at quarter points on each pair of studs. Attach cross bracing to studs with metal screws.
- .14 Lateral support bracing channels:
 - .1 Stiffen partitions over 3 m (10') in vertical span, at mid-height to maximum vertical spacing of 2440 mm (8') on centre, with at least one 19 mm (3/4") horizontal bracing channel, extending full length of partition, overlapping at least two stud spaces at ends of bracing channels.
 - .2 Stiffen partitions at not more than 150 mm (6") from the top and bottom of openings and across two full stud spaces at each side of openings with horizontal bracing channel.
- .15 Install steel stud reinforcement 1.720 mm (0.0677") at door frames and brace above ceiling. Secure to top and bottom structure with angle brackets and anchors.

3.8 Control Joints

- .1 Control joints: in accordance with Section 09 29 00.

Metal Supports for Gypsum and Cement Board

3.9 Concrete Anchors

- .1 Provide anchors and anchorage points in reinforced concrete floor slab underside in accordance with gypsum board manufacturer's suspension requirements and in compliance with engineered shop drawings. Drill holes with carbide-tipped drill bits conforming to ANSI B212.15-1994 (R2000).
- .2 *Provide* anchors; minimum installation depth, and method of expansion as recommended by the anchor manufacturer.

3.10 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Field tests and inspections:
 - .1 Independent inspection and testing company will perform random load tests for ceiling anchor installation.
 - .2 Allow for testing of 1 in 20 anchors.

END OF SECTION

Gypsum Board

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Gypsum board; standard and fire-rated, glass scrim faced.
 - .2 Gypsum board; interior mould and moisture resistant; glass scrim.
 - .3 Gypsum board; abuse resistant.
 - .4 Gypsum board; impact resistant.
 - .5 Gypsum board; shaftwall liner panels, glass scrim.
 - .6 Gypsum board; tile backer board; glass scrim.
 - .7 Cement board (cementitious board); tile backer board.
 - .8 Exterior sheathing board; glass scrim.
 - .9 Gypsum board accessories and miscellaneous related materials.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Fire-rated assembly listings and STC assembly ratings:
 - .1 Submit fire-rated assembly listings for each required fire resistance rated assembly for work of this section.
 - .2 Submit STC assembly ratings for each required STC rated assembly for work of this section.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*. Shall have 10 years' experience, minimum, in successful installation of work of type and quality indicated and specified.

1.4 Field Conditions

- .1 Comply with requirements of referenced gypsum board application standards and recommendations of gypsum board manufacturer, for environmental conditions before, during and after application of gypsum boards.
- .2 Install paper-faced gypsum panels after installation areas are enclosed and conditioned.
- .3 Panels that are wet, moisture damaged, or mould damaged shall not be installed.

Gypsum Board

- .1 Indications that panels are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.
- .2 Indications that panels are mould damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Single source responsibility: Obtain gypsum and cement board products from a single manufacturer.
- .2 Fire resistance rating:
 - .1 Construct fire resistance rated assemblies in accordance with listing and CAN/ULC S101-14.
- .3 Paper-faced gypsum board: in accordance with ASTM C1396/C1396M-17.
- .4 Glass scrim gypsum board: in accordance with ASTM C1658/C1658M-13.
- .5 Fire rated in accordance with listed assemblies where indicated: Type X or Type C.
- .6 Cement board: in accordance with ASTM C1325-17a.

2.2 Gypsum Board Panels

- .1 Minimum thickness: 15.9 mm (5/8").
- .2 Gypsum board; standard and fire-rated; glass scrim:
 - .1 *Acceptable Products:*
 - .1 CertainTeed 'GlasRoc Interior Type X'.
 - .2 CGC 'Sheetrock Brand Glass-Mat Panels Mold Tough Firecode X'.
 - .3 Georgia-Pacific 'DensArmor Plus Fireguard and Fireguard C'.
- .3 Gypsum board; interior mould and moisture resistant, glass scrim:
 - .1 Resistant to mould growth with highest level of performance (score of 10) when tested to ASTM D3273-21.
 - .2 *Acceptable Products:*
 - .1 CGC 'Sheetrock Brand Glass-Mat Panels Mold Tough Regular/Firecode X'.
 - .2 Georgia-Pacific 'DensArmor Plus Fireguard High-Performance Interior Panel'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Gypsum board; abuse resistant:
 - .1 Mould and moisture resistant: in accordance with ASTM D3273-21, with a panel score of 10.
 - .2 Abuse resistance performance:

Gypsum Board

- .1 Surface abrasion surface damage: in accordance with ASTM D4977/D4977M-20, Level 3.
- .2 Surface indentation surface damage: in accordance with ASTM D5420-21, Level 1.
- .3 Soft-body impact penetration: in accordance with ASTM E695-22, Level 2.
- .4 Hard Body Impact resistance: in accordance with ASTM C1629/C1629M-19, App.1, Level 1.
- .3 Glass mat faced:
 - .1 Acceptable *Products*:
 - .1 CGC 'Sheetrock Brand Glass-Mat Panels Mold Tough AR Firecode X'.
 - .2 Substitution: in accordance with Section 01 25 00.
- .5 Gypsum board; impact resistant:
 - .1 Mould and moisture resistant: in accordance with ASTM D3273-21, with a panel score of 10.
 - .2 Glass mat faced:
 - .1 Impact resistance performance:
 - .1 Surface abrasion surface damage: in accordance with ASTM D4977/D4977M-20, Level 3.
 - .2 Surface indentation surface damage: in accordance with ASTM D5420-21, Level 1.
 - .3 Soft-body impact penetration: in accordance with ASTM E695-22, Level 3.
 - .4 Hard Body Impact resistance: in accordance with ASTM C1629/C1629M-19, App.1., Level 2.
 - .2 Acceptable *Products*:
 - .1 CGC 'Sheetrock Brand Glass-Mat Panels Mold Tough VHI Firecode X'.
 - .2 Georgia-Pacific 'DensArmor Plus Impact-Resistant Interior Panel'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .6 Gypsum board; shaftwall assemblies, glass scrim:
 - .1 Mould and moisture resistant: in accordance with ASTM D3273-16, with a panel score of 10.
 - .2 Acceptable *Products*:
 - .1 CertainTeed 'GlasRoc Shaftliner'.
 - .2 CGC 'SHEETROCK Glass-Mat Liner Panels'.
 - .3 Georgia-Pacific 'Dens-Glass Shaftliner'.
- .7 Gypsum board; tile backer, glass scrim:

Gypsum Board

- .1 In accordance with ASTM C1178/C1178M-13.
- .2 Acceptable *Products*:
 - .1 CertainTeed 'GlasRoc Diamondback Tile Backer'.
 - .2 CGC 'Durock Brand Glass-Mat Tile Backerboard'.
 - .3 Georgia-Pacific 'Dens-Shield Tile Backer'.
- .8 Exterior sheathing board; fibreglass mat faced:
 - .1 Service grade: Exterior grade.
 - .2 In accordance with ASTM C1396/C1396M-17 and ASTM C1177/C1177M-13.
 - .3 Acceptable *Products*:
 - .1 CertainTeed 'GlasRoc Sheathing'.
 - .2 CGC 'Securock Glass-Mat Sheathing'.
 - .3 Georgia-Pacific 'DensGlass Sheathing'.

2.3 Cement Board Panels

- .1 Cement (cementitious) board; interior grade:
 - .1 Composition: Portland cement, sand, and may contain expanded polystyrene beads. Free of gypsum, organic fibres or cellulose.
 - .2 Acceptable *Products*:
 - .1 CGC 'Durock Brand Cement Board with EdgeGuard'.
 - .2 Unifix 'PermaBase Plus Cement Board'.
 - .3 Substitutions: in accordance with Section 01 25 00.

2.4 Attachment Materials

- .1 Screws; for gypsum board: bugle head, fine thread, self-tapping, Type W or S or S-12 point to suit framing type and metal gauge, with corrosion resistant finish in accordance with ASTM C1002-07/ASTM C954-11.
 - .1 Screw sizing:
 - .1 #6 x 25 mm (1") for single thickness board fastening.
 - .2 #6 x 32 mm (1-1/4") for single thickness 15.9 mm (5/8") board fastening.
 - .3 #7 x 41 mm (1 5/8") for double thickness board fastening.
- .2 Screws; for exterior sheathing board: in accordance with exterior sheathing board manufacturer's installation requirements to comply with design wind loads.
 - .1 Provide thermoset polyester coated screws formulated to provide enhanced corrosion protection for exterior glass scrim gypsum board and soffit board applications.
- .3 Screws; for cement board: Wafer head, Type S-12 point or 'Hi-Lo', self-tapping, with corrosion resistant polymer finish.

Gypsum Board

- .4 Tie wire: 1.6 mm (0.063") diameter galvanized soft annealed steel wire.

2.5 Accessories

- .1 Accessories: in accordance with ASTM C1047-19 unless otherwise indicated, maximum length pieces per location. Flanges shall be free from dirt, grease, or other material that adversely affects the bond of joint treatment or decoration.
- .2 Trims:
 - .1 Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - .1 Shapes:
 - .1 Corner bead.
 - .1 Mechanically fastened corner beads at impact resistant gypsum walls.
 - .2 "L" or "LC" beads.
 - .3 Reveal trims.
 - .4 Control joints, certified by manufacturer for use at fire resistance rated assemblies as required.
 - .3 Aluminum acoustic closure for partition interface with aluminum mullions:
 - .1 Acceptable *Product*:
 - .1 Gordon 'Mullion-Mate Series 60'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Description: Provide sound barrier mullion trim caps of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces and thermal movements. Furnish units in lengths of sufficient additional length to allow for field trimming to required length to match variations in construction tolerances of adjacent systems.
 - .3 Finish:
 - .1 Custom colour powder coat, finish to match glazing mullion colour.

2.6 Related Support Assemblies and Backer Plates

- .1 Wind bearing metal studs at wind bearing exterior assemblies: in accordance with Section 05 41 13.
- .2 Metal support systems and backer plates at interior assemblies: in accordance with Section 09 22 00.

2.7 Joint Treatment Materials

- .1 General: Comply with ASTM C475/C475M-17(2022).
- .2 Joint tape: in accordance with manufacturer's written requirements.

Gypsum Board

- .3 Joint compound for interior gypsum board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - .1 Prefilling: Use setting-type compound as recommended by panel board manufacturer.
 - .2 Embedding and first coat: Use setting-type or taping compound as recommended by panel board and trim accessory manufacturers.
 - .3 Fill and finish coats: Use sanding type setting-type or taping compound as recommended by panel board manufacturer.
- .4 Joint compound for exterior applications: in accordance with manufacturer's written requirements.
- .5 Joint compound for tile backing panels: in accordance with manufacturer's written requirements.

2.8 Acoustic Wall Assembly Materials

- .1 Acoustic sealant; concealed locations: to meet material requirements as listed in Part 9 of ASTM C919-22, including ASTM C834-10 or ASTM C920-14:
 - .1 Acceptable *Products*:
 - .1 Hilti Canada Corp 'CS-S SA Light'.
 - .2 Owens Corning 'QuietZone Acoustic Sealant'.
 - .3 Pecora 'BA-98'.
 - .4 Pecora 'AC-20'.
 - .5 Tremco 'Tremflex 834'.
 - .6 Substitutions: in accordance with Section 01 25 00.
 - .2 Acoustic sealant; exposed locations, acrylic:
 - .1 Acrylic/latex acoustic sealant, Type S, Grade NS, Class 12.5 to ASTM C920-14, maximum VOC content 60 g/L, non-hardening or ASTM C834-10, Type OP, Grade -18° C.
 - .2 For exposed sealants use paintable sealant products, do use non-skinning type products where they are exposed to view or where sealant products may deteriorate (stain or bleed into) into painted surfaces.
 - .3 Acceptable *Products*:
 - .1 Hilti Canada Corp 'CS-S SA Light'.
 - .2 Master Builders Solutions Canada 'MasterSeal NP 520'.
 - .3 Owens Corning 'QuietZone Acoustic Sealant'.
 - .4 Pecora 'AC20'.
 - .5 Tremco 'Tremflex 834'.

Gypsum Board

- .3 Smoke and acoustic sealant; concealed and exposed locations, non-fire-rated acoustic assemblies:
 - .1 Acrylic smoke and acoustic sealant, in accordance with ASTM C834-10 maximum VOC content 60 g/L, paintable, Flame Spread Value of maximum 25 to CAN/ULC-S102-10.
 - .2 Sealant shall not deteriorate (stain or bleed into) painted surfaces.
 - .3 Acceptable *Products*:
 - .1 Hilti Canada Corp 'CS-S SA Light'.
 - .2 Tremco 'Tremstop Smoke & Sound Sealant'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Acoustic sealant for plenum locations: Smoke-seal sealant with flame-spread not more than 25 and smoke developed classification not more than 50 to CAN/ULC-S102-10, in accordance with Section 07 84 00.
- .5 Acoustic compound: premixed perlite plaster.
- .6 INSUL-8; Acoustic (sound attenuation) insulation:
 - .1 Mineral-fibre sound attenuation batts: in accordance with CAN/ULC S702-14, Type 1, fire resistant and non-combustible to CAN/ULC-S114-05, high density for sag-free, tight fitting installation.
 - .1 Density: minimum 40 kg/m³ (2.5 lbs/ft³).
 - .2 Acceptable *Products*:
 - .1 Johns Manville 'MinWool Sound Attenuation Fire Batts'.
 - .2 Owens-Corning 'Thermafiber SAFB'.
 - .3 Rockwool 'AFB'.

2.9 Access Doors

- .1 Access doors: in accordance with Mechanical and Electrical Specifications.

PART 3 - EXECUTION

3.1 Installation

- .1 General:
 - .1 Comply with ASTM C840-18b, GA 216-21, GA 600-21, and manufacturer's written requirements, except as otherwise indicated.
 - .2 Do not bridge building expansion joints with support system.
 - .3 Frame both sides of joints with furring and other supports as indicated.
- .2 Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1.6 mm (1/16") open space between boards. Do not force into place.

Gypsum Board

- .3 Cover both faces of stud partition framing with gypsum board in concealed spaces (above ceiling, and the like) unless otherwise indicated, except in chase walls which are properly braced internally.
- .4 Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cut-outs.
- .5 Apply components of fire-rated assemblies in conformance with indicated designs.
- .6 Do not apply gypsum board in close proximity to hot pipes or heating ducts.
- .7 Install materials with the minimum number of joints. Tightly butt joints, without force, and neatly align them.
- .8 Frame openings on every side. Provide clearances with services.
- .9 Work shall include bulkheads over doors, frames, screens, and changes in ceiling levels, pipe space and as indicated.
- .10 Provide clearances between work of this section and structural elements to prevent transference of structural loads in accordance with Section 09 22 00.
- .11 Tolerances:
 - .1 Do not exceed 3 mm (1/8") in 3 m (10') variation from plumb, level, and plane in exposed surfaces, except at end joint between gypsum board panels.
 - .2 Do not exceed 10 mm (3/8") from indicated location.
 - .3 Do not exceed 1.5 mm (1/16") variation between planes of abutting edges or ends.
 - .4 Surface flatness shall not exceed 1.5 mm (1/16") within 305 mm (12") straight edge. For non-tapered-edge end joints between boards, measure flatness tolerance with end of straight end at centreline of joint.

3.2 Accessories

- .1 At external corners install corner trim secured to framing at 230 mm (9-1/16") on centre on both flanges with screw fasteners or clinch tool.
- .2 Secure casing trim at board edges where exposed to view, where board butts against other materials with no trim to conceal junction, at perimeter of ceiling surfaces at tops of partitions where they stop against continuous ceiling surfaces, and where indicated.
- .3 Erect accessories straight, plumb or level, rigid and at proper plane.
- .4 Use full length pieces.
- .5 Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners, free from rough edges. Secure in accordance with manufacturer's specifications unless otherwise required.
- .6 Installation tolerances:
 - .1 Alignment with board panels shall not exceed tolerances specified above.
 - .2 End joints shall be flush aligned to maximum offset of 0.5 mm (0.020").

Gypsum Board

3.3 Board Application - General

- .1 Before installation of board commences, ensure that internal services have been installed, tested, and approved; conduits, pipes, cables, and outlets are plugged, capped, or covered; and that fastenings and supports installed by others are in place.
- .2 Extend board into door, window, and other openings, reveals, behind fitments, and other applied items and on metal stud partitions to structure above unless indicated otherwise.
- .3 Apply board with long dimension perpendicular to supports, unless otherwise indicated.
- .4 Locate joints on opposite sides of partitions on different studs, and at least 305 mm (12") from opening jambs.
- .5 Install board to minimize joints, and align end joints to be the least objectionable (where they are unavoidable), according to the indicated lighting design. Locate joints in ceilings where least prominently discerned, and never line them up with opening edges.
- .6 Form smooth joints at ends and at field cut edges of board panels.
- .7 Fasten board to metal support members by metal gypsum board screws, 9.5 mm (0.374") minimum to, and 12.7 mm (1/2") maximum from, centre of joints.
 - .1 Space screws:
 - .1 At fire rated board as per fire-rated assembly.
 - .2 At typical board walls at 400 mm (16") on centre at edges and field unless otherwise required.
 - .3 At typical board ceilings at 305 mm (12") on centre at edges and field unless otherwise required.
- .8 Offset gypsum board joints 150 mm (6") minimum from corners of openings.
- .9 Locate gypsum panel product joints so that no joint will align with the edge of an opening unless control joints are to be installed at these locations.

3.4 Interior Mould and Moisture Resistant Gypsum Board Application

- .1 Apply water resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

3.5 Exterior Sheathing Board Application - Gypsum Sheathing Board

- .1 Gypsum sheathing board: Install sheathing in accordance with manufacturer's written requirements and applicable instructions in GA 253-21, ASTM C1280-18, and ASTM C1397-13(2019). Do not bridge building expansion joints with support system. Frame both sides of joints with furring and other supports as indicated.
- .2 Use maximum board lengths to minimize number of joints. Stagger sheathing joints, offset by at least one framing member. Offset gypsum board joints 150 mm (6") minimum from corners of openings.
- .3 Install sheathing with exterior board side facing exterior. Butt boards together for a light contact at edges and ends with not more than 1.6 mm (1/16") open space between boards. Do not force into place.

Gypsum Board

- .4 Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.
- .5 Locate fasteners minimum 10 mm (3/8") from edges and ends of sheathing boards.
- .6 Provide and install fasteners in accordance with manufacturer's written requirements to comply with design wind loads.
- .7 Provide clearances between work of this section and structural elements to prevent transference of structural loads, and in no case less than 16 mm (5/8").
- .8 Tolerances:
 - .1 Sheathing where acting as substrate for direct applied or insulated finishing system shall be flat to within 6 mm in 3050 mm (1/4" in 10'), in accordance with ASTM C1397-13(2019).
 - .2 Maximum gap between board joints: 1.6 mm (1/16").
- .9 Replace damaged or weathered sheathing boards.

3.6 Abuse Resistant Board Application

- .1 Install abuse resistance gypsum board in accordance with gypsum board manufacturer's written requirements.
- .2 Where both abuse resistant gypsum panels and plain gypsum board are used together on the same surface plane adjacent to one another, a smooth transition between the two types of boards is required. Finish the work in a manner such that the transition provides an inconspicuous joint when viewed by a person at normal viewing angles while standing in front of the boards from a distance of not less than 1000 mm (39").

3.7 Impact Resistant Board Application

- .1 Install impact resistance gypsum board in accordance with gypsum board manufacturer's written requirements.
- .2 Where both impact resistant gypsum panels and plain gypsum board are used together on the same surface plane adjacent to one another, a smooth transition between the two types of boards is required. Finish the work in a manner such that the transition provides an inconspicuous joint when viewed by a person at normal viewing angles while standing in front of the boards from a distance of not less than 1000 mm (39").

3.8 Interior Tile Backer Board Application

- .1 Install in accordance with manufacturer's written requirements.
- .2 Section 09 31 00 to install tile setting material over tape installed by this section. Install mesh tape centred over tile backer board joints.

3.9 Interior Cement Board

- .1 Install in accordance with manufacturer's written requirements.

Gypsum Board

3.10 Acoustic Wall Assemblies

.1 Acoustical sealant and plaster:

- .1 Apply acoustical sealant to seal gaps in accordance with ASTM C919-22 and in accordance with the STC rated assembly.
- .2 Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919-22 and with manufacturer's written requirements for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- .3 Clean substrate, remove debris and deleterious substances.
- .4 Apply sealant to close voids; no leaks around track and gypsum board.

.2 Sound attenuation insulation:

- .1 Install sound attenuation insulation to fill cavity unless otherwise indicated.
- .2 Trim insulation to provide close-fit contact to framing assemblies and fill the partition cavity or acoustic insulation assemblies to thicknesses specified or indicated.
- .3 Maintain air space between backs of sound attenuation insulation and back of opposite partition face layer, as applicable.
- .4 Cut insulation to provide close-fit contact around electrical boxes, pipes, and other obstructions and penetrations through and within acoustic assemblies.
- .5 Extend acoustic partition assemblies to underside of structure. Incorporate approved provision to prevent transmittance of structural deflection to partition assembly.
- .6 Staple sound attenuation insulation where required by manufacturer's installation requirements.
- .7 Where studs are not faced with gypsum board on both sides, mechanically fasten wire mesh to non-faced side of stud to retain insulation.
- .8 Mechanically attach sound attenuation insulation in wall assemblies where cavity of wall assembly is greater than 150 mm (6").
- .9 Secure insulation in such a manner that it will not sag or settle away from required locations.

.3 Sound flanking paths:

- .1 Where sound rated partition walls intersect non rated gypsum board partition walls, extend sound rated construction to completely close sound flanking paths through non rated construction.
- .2 Seal joints between face layers at vertical interior angles of intersecting partitions.

Gypsum Board

3.11 Finishing

- .1 Provide levels of gypsum board finish for locations as follows, in accordance with GA 214-21.
 - .1 Level 1: Ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
 - .2 Level 2: Gypsum board substrate at applied hard surfaces, except remove tool marks and ridges.
 - .3 Level 3: Skimming of existing drywall at new commercial grade vinyl wallcovering.
 - .4 Level 4: Exposed paper faced gypsum board surfaces, except where another finish level is indicated.
 - .5 Level 5: Exposed glass scrim gypsum board surfaces and where indicated.
- .2 Interior gypsum board:
 - .1 Prefill:
 - .1 Use setting-type joint compound. Mix joint compound according to manufacturer's written requirements.
 - .2 Fill joints between boards flush to top of eased or beveled edge.
 - .3 Fill joints of gypsum board above suspended ceilings in fire rated partitions.
 - .4 Wipe off excess compound and allow compound to harden.
 - .5 Prefill joint gaps not greater than 3.2 mm (1/8") with either ready-mix or setting type joint compound; prefill joint gaps greater than 3.2 mm (1/8") with setting-type joint compound.
 - .2 Taping (Level 1):
 - .1 Butter taping compound into inside corners and joints.
 - .2 Centre tape over joints and press down into fresh compound.
 - .3 Remove excess compound.
 - .4 Tape joints of gypsum board above suspended ceilings.
 - .3 First coat (Level 2):
 - .1 Use taping or all-purpose drying-type compound.
 - .2 Immediately after bedding tape, apply skim coat of compound and allow to dry completely in accordance with manufacturer's written requirements.
 - .3 Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.
 - .4 Cover fastener heads and accessories with 1 coat of joint compound.
 - .4 Second coat (Level 3): After first coat treatment is dried, apply second coat of compound over tape and trim, feathering compound 50 mm (2") beyond edge of first coat.

Gypsum Board

- .1 Cover fastener heads and accessories with total of 2 separate coats of joint compound.
- .5 Third coat (Level 4):
 - .1 After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 50 mm (2") beyond edge of second coat.
 - .2 Allow third coat to dry. Apply additional compound, and touch-up and sand, to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.
 - .3 Finished joints will be accepted with a camber not greater than 1 mm (1/32") and shall be seamless, plumb, true and flush and with square, neat corners.
 - .4 Cover fastener heads and accessories with total of 3 separate coats of joint compound.
 - .5 Where new partitions align with existing gypsum board, apply required amount of skim coats to make transition inconspicuous from a distance of 914 mm (36").
 - .6 Completed installation at interface between new and existing construction shall provide an inconspicuous joint.
- .6 Skim coat (Level 5):
 - .1 After the fourth coat has dried, apply skim coat over exposed surfaces of gypsum board in accordance with manufacturer's written requirements.
 - .2 After skim coat has dried, touch-up and sand to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.
- .3 Interior mold and moisture resistant gypsum board: Treat fastener heads and joints with setting-type joint compound.
 - .1 For joints to be covered with tile, apply tape and joint compound bedding coat and skim coat only; do not apply finish coats.
 - .2 Do not crown joints or leave excess compound on panels.
 - .3 Remove tool marks and ridges.
 - .4 For fastener heads to be covered with tile, apply one coat of joint compound.
- .4 Interior tile backer board: Prepare and finish joints in accordance with manufacturer's written requirements.
- .5 Cement board: Prepare, tape, and finish joints in accordance with manufacturer's written requirements.
- .6 Joint compound:
 - .1 Apply finish coat of compound feathering 75 to 100 mm (3" to 4") beyond tape edges.
 - .2 Feather coats onto adjoining surfaces so that camber is maximum 0.79 mm (1/32").

Gypsum Board

.7 Trim:

- .1 Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
- .2 Install metal corner beads at external corners.
- .3 Install metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi exposed, and where gypsum base terminates against dissimilar material.
- .4 Erect beads plumb or level, with minimum joints.

.8 Control joints:

- .1 Provide control joints set in board facing. Support control joints with studs or furring channels on both sides of joint.
- .2 Provide control joints in required locations.
 - .1 Review control joint locations with *Consultant* prior to installation.
- .3 Install control joints where a partition, wall, or ceiling traverses a construction joint (expansion, seismic or building control element) in the building structure.
- .4 Install control joints where a wall or partition runs in an uninterrupted straight plane exceeding 9100 mm (30 linear feet).
- .5 Install control joints in interior ceilings:
 - .1 With perimeter relief:
 - .1 Linear dimensions between control joints shall not exceed 15000 mm (50 ft) and total area between control joints shall not exceed 230 m² (2500 ft²).
 - .2 Without perimeter relief:
 - .1 Linear dimensions between control joints shall not exceed 9100 mm (30 ft) and total area between control joints shall not exceed 84 m² (900 ft²).
- .6 Install control joints where ceiling framing members change direction.
- .7 Where a control joint occurs in an acoustical or fire-rated system, provide blocking behind the control joint by using a backing material such as 16 mm (5/8") Type X gypsum panel products, mineral fibre, or other tested equivalent. Construct through-wall control joints at fire-rated assemblies in accordance with assembly listing requirements.
- .8 Line up control joints with joints in other construction or with centre lines of mullions, columns, piers, or similar building elements, where accepted by *Consultant*.
- .9 Install control joints straight and true.
- .10 Ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners. If control joints are not used, additional reinforcement is required at corners to distribute concentrated stresses.

Gypsum Board

- .11 Locate board joints so that no joint will align with the edge of an opening unless control joints are to be installed at these locations.

3.12 Fire Separations

- .1 Install fire-rated assemblies in accordance with assembly listing requirements in order to obtain fire ratings indicated and as required by authorities having jurisdiction.
- .2 Vertical bulkheads in ceiling spaces over fire rated partitions, doors and the like shall have same fire rating as the partition over which they occur. Such bulkheads shall be of gypsum board construction unless otherwise indicated.
- .3 Use fire rated gypsum wallboard as specified.
- .4 Where lighting fixtures, diffusers, and the like are recessed into fire rated ceilings or bulkheads, provide enclosure to maintain required fire rating. Form removable panel to give access to fixture outlet box.
- .5 Where fire hose cabinets or other fixtures or equipment are recessed in fire rated walls or partitions, provide gypsum board enclosure or backing to maintain required fire rating, unless otherwise detailed.

3.13 Access Doors

- .1 Install access doors to mechanical and electrical fixtures specified in respective Mechanical and Electrical Sections.
- .2 Access doors shall be as supplied by Divisions 21, 22, and 23. Locations to be reviewed and confirmed by *Consultant*.
- .3 Install access panels in locations to be determined by coordination with trades installing mechanical, electrical and other building services and consultation with *Consultant*.
- .4 Rigidly secure frames to furring or framing systems.

3.14 Adjusting and Cleaning

- .1 Clean up and remove surplus materials and rubbish resulting from the work of this section upon completion.
- .2 Clean off beads, casings, joint compound droppings and the like, leave the work of this section ready for painting trades.

END OF SECTION

Tiling

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Interior hard surface tiling.
 - .2 Mortar bed for tiling.
 - .3 Thin-set mortar for tiling.
 - .4 Levelling underlayment.
 - .5 Crack isolation membrane.
 - .6 Trim accessories.

1.2 References

- .1 Definitions:
 - .1 Large format tile: Tiles with dimension measured along any edge 380 mm (15") and greater.

1.3 Administrative Requirements

- .1 Sequencing and scheduling:
 - .1 Coordinate installation of tile work with related work.
 - .2 Proceed with tile work only after curbs, vents, drains, piping, and other projections through substrate have been installed and when substrate construction and framing of openings have been completed.

1.4 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
 - .2 Submit manufacturer's installation requirements for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Indicate location and sizes of control joints.
- .4 Samples:
 - .1 Submit 2 -full size samples of each type of tile and size specified.
 - .2 Submit 2 -full size samples of each unglazed tile, fully grouted (4 tiles) with selected grout colours to determine whether staining will be a problem.
 - .3 Submit 2 - 305 mm (12") long samples trim accessory.

Tiling

- .4 Submit 2 - 305 mm (12") long samples of control joint sealant.
- .5 Test and evaluation reports:
 - .1 Submit moisture, alkalinity, and mortar bond test results.
- .6 Tiling system manufacturer's system warranty and design criteria:
 - .1 Submit tiling system manufacturer's warranty specimen and warranty design criteria prior to the commencement of work of this section.

1.5 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance requirements for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Provide minimum 5% of each type and colour of tile required for the *Work* for maintenance use.
 - .2 Maintenance material to be of same production run as installed material.

1.6 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*:
 - .1 Has adequate plant, equipment, and skilled workers to perform the work expeditiously.
 - .2 Has successfully completed installations similar to that specified during a period of at least the immediate past 5 years.
 - .3 Shall be a member company in good standing of the Terrazzo, Tile and Marble Association of Canada and have been a member for at least the past 5 years.
- .2 Mock-ups:
 - .1 Grouted mock-up: 1220 mm x 1220 mm (48" x 48") sample panels of each tile type and colour, texture, size, and pattern of tile and grout.
 - .2 Install each tile product and colour mock-up for acceptance by *Consultant*. Accepted mock-up shall form basis of standard of workmanship for remainder of work.
 - .3 Mock-up shall consist of floor/wall/base corner intersection, with 300 mm (12") of finish product on each face and control joints.

1.7 Field Conditions

- .1 Ambient conditions:

Tiling

- .1 Execute work of this section while ambient temperature and humidity within safe working temperatures in accordance with manufacturer's installation requirements for a period of 72 hours before, during and following installation. Avoid concentrated or irregular heating during curing period.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 ANSI - American Standard Specification for the Installation of Ceramic Tile.
- .2 Terrazzo, Tile and Marble Association of Canada ("TTMAC") Specification Guide 09 30 00 Tile Installation Manual TTMAC 2019-2021 Specification Guide 09 30 00, Tile Installation Manual.
- .1 Slip resistance: Floors shall have a wet Dynamic Coefficient of Friction (DCOF) of 0.42 or greater in accordance with ANSI A326.3.
- .2 Tiling systems shall exhibit none of the following once installed:
 - .1 Staining or discolouration of tile due to mortar or grout.
 - .2 Delaminating of tile.
 - .3 Cracked or chipped tiles.
 - .4 Cracked grout.

2.2 General

- .1 Tile products shall be from same production run, dye lot, calibre, and batch number. If shading variation is evident, notify *Consultant* prior to installation.

2.3 Tile Products

- .1 Wall tile:
 - .1 PORC/T1; Porcelain tile:
 - .1 Size: Multi-format kit – Pattern #2.
 - .2 Finish: Matte.
 - .3 Colour: Natural.
 - .4 Acceptable *Products*:
 - .1 Deco-Tile 'Saint Tropez'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .2 Floor tile:
 - .1 PORC/T2; Porcelain tile:
 - .1 Size: 305 mm x 610 mm x 9 mm (12" x 24" x 3/8").
 - .2 Finish: Matte.
 - .3 Colour: Cloud.

Tiling

.4 Acceptable *Products*:

- .1 Stone Tile 'STI Gubi Floor'.
- .2 Substitutions: in accordance with Section 01 25 00.

2.4 Mortar Materials

.1 Unless otherwise specified, select from the following thin-set mortar:

.1 Latex modified Portland cement thin set mortar gauged:

- .1 ANSI A118.4 (ANSI A108/A118/A136.1-20) and ANSI A118.11 (ANSI A108/A118/A136.1-20).
- .2 White colour for translucent tile applications.
- .3 Acceptable *Products*:
 - .1 Ardex 'X77 Microtec Fiber Reinforced Mortar' with Ardex 'E90 Mortar Admix'.
 - .2 Custom Building Products 'ProLite'.
 - .3 Flextile '51' mixed with Flextile '44'.
 - .4 Mapei 'KERALASTIC' mixed with 'KERABOND'.
 - .5 Profix '6500' liquid latex mixed with '8500' thin set mortar.
 - .6 Promo Adhesives Inc. 'Pro Bond Plus' with 'Pro Bond Plus Additive'.
 - .7 TEC 'Superflex Ultra-Premium Thin Set'.

.2 Enriched, modified, Portland cement thin set mortar, single component, with integral polymer:

- .1 ANSI A118.4 (ANSI A108/A118/A136.1-20) and ANSI A118.11 (ANSI A108/A118/A136.1-20).
- .2 White colour for translucent tile applications.
- .3 Acceptable *Products*:
 - .1 Ardex 'X 5 Flexible Tile & Stone Mortar'.
 - .2 Custom Building Products 'Versabond LFT'.
 - .3 Flextile '52'.
 - .4 Laticrete '254 Platinum Multipurpose Thin-Set Mortar'.
 - .5 Mapei 'Ultraflex 3' or 'Ultraflex RS'.
 - .6 Profix 'Megaflex' thin set mortar.
 - .7 Promo Adhesives Inc. 'Pro HPX'.
 - .8 TEC 'Ultimate Large Tile Mortar'.

.2 Special mortar and setting materials:

- .1 Mortar for large format tiles meeting definition under paragraph 1.2.1.1:

Tiling

- .1 Enriched, modified, fast-set Portland cement medium bed mortar high-hydration, low residual moisture behind the tile formula.
- .2 ANSI A118.4 (ANSI A108/A118/A136.1-20) and ANSI A118.11 (ANSI A108/A118/A136.1-20).
- .3 Substrate primer: in accordance with manufacturer's installation requirements.
- .4 White colour for translucent tile applications and light coloured stones.
- .5 *Acceptable Products:*
 - .1 Ardex 'S 28 Microtec Rapid Hardening and Rapid Drying Semi-Pourable Natural Stone Floor Tile'.
 - .2 Custom Building Products: 'MegaLite'.
 - .3 Flextile '58XT'.
 - .4 Mapei 'Granirapid'.
 - .5 Laticrete '4-XLT Rapid'.
 - .6 Profix 'Flex GT-30'.
 - .7 Profix 'Optiflex' Full-Contact Mortar.
 - .8 Promo Adhesives Inc. 'Pro Quick SF' with 'Pro Quick Plus Additive'.
 - .9 TEC 'Fast Set Ultimate Large Tile Mortar'.
 - .10 TEC 'Fast Set 3N1 Performance Mortar'.
- .2 Latex-Portland cement mortar for thick beds, levelling beds and scratch coats:
 - .1 ANSI A118.4 (ANSI A108/A118/A136.1-20) and ANSI A118.11 (ANSI A108/A118/A136.1-20).
 - .2 *Acceptable Products:*
 - .1 Ardex 'A 38 Rapid Hardening and Drying Cement for Floor Screeds in Internal or External Locations'.
 - .2 Custom Building Products 'SpeedSlope'.
 - .3 Custom Building Products 'Thick Bed Bedding Mortar'.
 - .4 Flextile '4:1 Dry Pack Mortar mixed with Flextile '44'.
 - .5 Laticrete '226 Thick Bed Mortar' gauged with Laticrete '3701 Mortar Admix'.
 - .6 Mapei 'Ultraflex LFT'.
 - .7 Profix 'GT 30' medium bed mortar.
 - .8 Promo Adhesives Inc. 'Pro P-151 SF'.
 - .9 TEC 'Floor Mud'.
- .3 Mortar for tile installations on metal substrate conditions:
 - .1 ANSI A118.3 (ANSI A108/A118/A136.1-20).
 - .2 *Acceptable Products:*

Tiling

- .1 Ardex 'WA High Performance, 100% Solids Epoxy Grout and Adhesive'.
 - .2 Custom Building Products 'EBM-Lite Premium Epoxy Bonding Mortar'.
 - .3 Flextile '100 Flex-Epoxy'.
 - .4 Laticrete 'Latapoxy 300 Adhesive'.
 - .5 Mapei 'Kerapoxy 410'.
 - .6 Profix 'Poly 800 Mortar and Grout'.
 - .7 Promo Adhesives Inc. 'Pro Grout Xtreme'.
 - .8 TEC 'AccuColor EFX Epoxy Special Effects Grout'.
- .3 Mortar beds, levelling coats:
- .1 Materials:
 - .1 Water: clean and free of chemicals detrimental to mortar and grout mixes.
 - .2 Sand: to ASTM C144-18, passing 16 mesh.
 - .3 Cement: to CSA A3002-13, Type U.
 - .4 Latex: Formulated for use with Portland cement mortars.
 - .5 Cleavage membrane: 0.10 mm (4 mil) thick polyethylene film to CAN/CGSB 51.34-M86.
 - .6 Reinforcing mesh: 51 mm x 51 mm (2" x 2") mesh size, fabricated from 1.6 mm (0.06") thick galvanized steel wire; welded fabric design.
 - .2 Mixes:
 - .1 Scratch coat (by volume): 1 part Portland cement, 4 parts sand, and water or latex where required by TTMAC detail. Premixed mortar may be used per manufacturer's requirements. Adjust liquid volume may be adjusted depending on water content of sand to obtain consistency and workability.
 - .2 Slurry bond coat: Mix Portland cement and water to a creamy paste consistency. Include latex additive where required by TTMAC detail.
 - .3 Mortar bed for walls (by volume): 1 part Portland cement, 4 parts sand, and water or latex where required by TTMAC detail. Premixed mortar may be used per manufacturer's requirements. Adjust liquid volume may be adjusted depending on water content of sand to obtain consistency and workability.
 - .4 Levelling coat (by volume): 1 part Portland cement, 4 parts sand, and water or latex where required by TTMAC detail. Premixed mortar may be used per manufacturer's requirements. Adjust liquid volume may be adjusted depending on water content of sand to obtain consistency and workability.

Tiling

- .5 Mortar bed for floors (by performance): 1 part Portland cement, 4 parts sand, and water or latex where required by TTMAC detail. Premixed mortar may be used per manufacturer's requirements. Adjust liquid volume may be adjusted depending on water content of sand to obtain consistency and workability that will allow compaction during tamping of the mortar bed, and achieve minimum compressive strength of 15 MPa after 28 days.
- .4 Levelling underlayment:
 - .1 Cement-based, quick-setting, self-levelling, self-drying underlayment for installations from featheredge to minimum 32 mm (1") thick in single application.
 - .2 Primer: Type as recommended by levelling underlayment manufacturer to suit substrate.
 - .3 Acceptable *Products*:
 - .1 Ardex 'Liquid BackerBoard Self-Levelling Underlayment'.
 - .2 Ardex 'TL 1000'.
 - .3 Custom Building Products 'TechLevel 100'.
 - .4 Flextile '5900 Flex-Flo Plus Self-Levelling Underlayment'.
 - .5 Laticrete 'Supercap SC500'.
 - .6 Mapei 'Ultraplan 1 Plus'.
 - .7 Promo Adhesives Inc. 'Pro Plan'.
 - .8 TEC 'Contractor Grade Self Levelling'.
 - .9 TEC 'Levelset 200'.

2.5 Grout Materials

- .1 Epoxy grout:
 - .1 ANSI A118.3 (ANSI A108/A118/A136.1-20).
 - .2 Acceptable *Products*:
 - .1 Ardex 'WA Epoxy Grout'.
 - .2 Custom Building Products: 'CEG-Lite 100% Solids Commercial Epoxy Grout'.
 - .3 Flextile 'Flex-Epoxy 100 Grout'.
 - .4 Laticrete 'SpectraLOCK PRO Grout'.
 - .5 Mapei 'Kerapoxy' or 'Kerapoxy CQ'.
 - .6 Profix 'Poly 800'.
- .2 Grout colours:
 - .1 PORC/T1: Mapei Biscuit 14.
 - .2 PORC/T2: Mapei Pewter 02.
- .3 Grout sealer: as recommended by grout manufacturer.

Tiling

2.6 Crack Isolation Membrane

- .1 Review floor assembly design (live load deflection) with *Consultant* and crack isolation membrane manufacturer's representative. Confirm crack isolation manufacturer's recommended product to *Consultant* in writing, on crack isolation membrane manufacturer's company letterhead prior to commencing the installation.
- .2 Crack isolation membrane shall be thin, flexible, cold applied, load bearing, ANSI A118.12 (ANSI A108/A118/A136.1-20) with Extra Heavy Service rating tested to ASTM C627-18 on concrete substrates. Materials to be non-toxic, non-flammable, and non-hazardous during storage, mixing, application and when cured.
 - .1 Accessories:
 - .1 Reinforcing fabric to be non-woven rot-proof specifically intended for crack isolation membrane as recommended by crack isolation membrane manufacturer.
 - .2 Mortar; for setting tile: Compatible product as recommended by crack isolation membrane manufacturer.
 - .2 Acceptable *Products*:
 - .1 Ardex '8+9 Waterproofing and Crack Isolation Compound'.
 - .2 Custom Building Products 'Crack Buster Pro'.
 - .3 Flextile 1000 Flexilastic'.
 - .4 Flextile 'WP980 Waterproof & Crack Isolation Membrane'.
 - .5 Laticrete 'Blue 92 Anti-Fracture Membrane'.
 - .6 Mapei 'Mapeguard 2'.
 - .7 Profix 'Imper'.
 - .8 Promo Adhesives Inc. 'Pro CBM Membrane'.
 - .9 TEC 'Hydraflex Waterproofing Crack Isolation Membrane'.

2.7 Accessories and Related Materials

- .1 Trim accessories:
 - .1 Edge protection: Schluter Systems 'JOLLY', stainless steel; continuous at exposed tile edges.
 - .1 Provide edge protection at outside corners where both wall surfaces are tiled.
- .2 Joint sealants: mildew resistant sealant in accordance with Section 07 92 00.
- .3 Control joint sealant:
 - .1 One-component, neutral cure, exterior grade silicone sealant.
 - .2 Tensile strength (ASTM C794-18(2022)): Minimum 1.5 MPa (225 psi).
 - .3 Hardness (ASTM D751-19; Shore A): Minimum 15.
 - .4 Weather resistance (QUV Weather-ometer): No change after 10,000 hours.

Tiling

- .5 Acceptable *Products*:
 - .1 Ardex 'SX'.
 - .2 Flextile 'Tile & Grout Caulk'.
 - .3 Laticrete 'Latasil Tile and Stone Sealant'.
 - .4 Mapei 'Mapesil T'.
 - .5 Profix 'Poly 400 Flexible Caulking'.
 - .6 TEC 'Accucolour 100% Silicone Sealant'.

PART 3 - EXECUTION

3.1 Examination

- .1 Ensure compatibility of *Products* supplied under this section, and which bear contact with substrate.
- .2 Before work of this section commences, examine the areas to be covered and report any flaw or adverse conditions in writing to the *Contractor* and the *Consultant*. Do not proceed with work until surfaces and conditions comply with the requirements indicated in the manufacturer's requirements and in ANSI A108.5 (ANSI A108/A118/A136.1-20) specification.
- .3 Miscalibrated tiles, tiles with chipped corners, tiles with holes, will not be accepted for installation.
- .4 Inspect tiles for colour variation. Tiles presenting noticeable variations shall be carefully selected, set aside and used in areas where they fit in the pattern homogeneously. Provide for appropriate lighting equipment in addition to existing lighting in the immediate area where the installation is being performed so that any shade differences which are normally very slight can be identified easily.

3.2 Preparation

- .1 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion or performance or may act as bond breaker.
- .2 Wire brush steel substrates to remove deleterious substances and rust, to promote full adhesion to steel.
- .3 Roughen surfaces with previously painted glossy finishes by sandpaper or other abrasive medium, and completely remove finishes which are not compatible with products specified under this section.
- .4 Prime gypsum, wood or porous concrete with primer, brush or roller applied at full strength in accordance with mortar manufacturer's recommendations.
- .5 Floor surfaces:
 - .1 Prepare concrete to receive levelling underlayment in accordance with International Concrete Repair Institute (ICRI) designation CSP-3.

Tiling

- .2 Prepare concrete to receive crack isolation membrane in accordance with International Concrete Repair Institute (ICRI) designation CSP-2.
- .3 Concrete shall be minimum of 90 days old.
- .4 At door opening locations where finished flooring is adjacent to weather-stripping or automatic door bottoms provide trowel-applied levelling compound to provide full contact between finished flooring and weather-stripping or automatic door bottoms. Taper trowel-applied levelling compound to transition with adjacent flooring substrate to be provide smooth and seamless transition at maximum slope of 3:1000 (height to distance) ratio.
- .6 Alkalinity and moisture testing:
 - .1 Perform moisture and alkalinity tests and mortar bond test.
 - .2 Where concrete substrate exhibits higher than permitted moisture and alkalinity levels, *Provide* water vapour reduction system and repeat moisture and alkalinity tests and mortar bond tests.
 - .3 Proceed with installation only after substrates pass testing. Document tests performed and submit in writing to *Consultant*.

3.3 Mixing

- .1 Mix mortars, additives and grouts in accordance with manufacturer's written requirements.

3.4 Levelling Underlayment Installation

- .1 Install levelling underlayment to tile flooring assemblies utilizing large format tile, except for large format tile installations over mortar bed sloped to drain.
- .2 Mix and apply primer to prepared subfloor. Allow to dry prior to installation of levelling material.
- .3 Mix and apply levelling material in accordance with manufacturer's written requirements to produce a smooth, flat surface.
 - .1 Apply levelling underlayment to provide substrate surface flatness tolerances to achieve $F_F 60$ in accordance with ASTM E1155-14 or 3 mm (1/8") with a 3000 mm (10'-0") straightedge.
- .4 Allow to set prior to installation of tile.

3.5 Crack Isolation Membrane Installation

- .1 Install crack isolation membrane system to comply with manufacturer's written requirements.
- .2 Install crack isolation membrane to tile flooring assemblies utilizing large format tile and as indicated.
- .3 Install crack isolation membrane to substrates for tile flooring installations located on suspended structural floor assemblies. Treat substrate with full coverage of crack isolation membrane and reinforcement in accordance with crack isolation membrane manufacturer's installation requirements.

Tiling

3.6 Installation - General

- .1 Install *Products* in accordance with manufacturer's specifications and as indicated herein, in accordance with TTMAC Specification Guide 09 30 00 Tile Installation Manual TTMAC 2019-2021 Specification Guide 09 30 00, Tile Installation Manual, and in accordance with ANSI A108.5 (ANSI A108/A118/A136.1-20) except where specified otherwise.

3.7 Thin-Set Method

- .1 Make joints even, straight, plumb and of uniform width.
- .2 Provide levelling coats in accordance with TTMAC details.
- .3 *Provide* edge protection at tile edges and corners, unless otherwise indicated, using maximum length pieces.
- .4 *Provide* edge protection and transition strips at tile transitions, unless otherwise indicated, using maximum length pieces.
- .5 Review locations of tile accessories with *Consultant* prior to setting tile and comply with directions of *Consultant*.
- .6 Lap tile and seal with sealant at inside corners. Caulk around pipes and openings made in tile with sealant.
- .7 Apply sealant at interface with frames at openings. Apply sealant in accordance with Section 07 92 00 and manufacturer's requirements.
 - .1 Sealant colour to later selection by *Consultant*.
- .8 Install flooring to entire area indicated or scheduled. Unless otherwise indicated, include coverplates occurring within finished floor areas. Maintain overall uniform continuity of colour and pattern with pieces of flooring installed on cover plates. Tightly butt edges to perimeter of floor around cover plates and to cover plates. Do not install flooring to floor drains occurring within finished floor areas.

3.8 Tile Setting

- .1 Lay out tile work as indicated on drawings, and where lay-out is not indicated, lay-out tiles so tiles less than 1/2 the least dimension do not occur and with minimum amount of cutting.
- .2 Using a damp towel, wipe off the back side of tile to remove any dust or other residue that may be left over from the manufacturing process.
- .3 Place as much tile as possible in one operation before setting bed reaches initial set. Clean back and remove bed when it has set before tile is laid.
- .4 Prime materials and by methods specified by manufacturer of bond coat.
- .5 Except where tiles have setting tabs, and except for expansion, control and isolation joints, maintain joint widths as selected by *Consultant*.
- .6 Back up tile coves, curbs and other shaped pieces solid with mortar. Rigidly set, reinforce or otherwise make firm and secure such pieces.

Tiling

- .7 Beat tiles in thoroughly and sufficiently to cause mortar ribs or notches to come together into a continuous void free bed and allow the mortar to flow up partially into the joint space to maximum of 1/3 the thickness of the tile. Sound floor tiles by tapping and reset tiles with voids in setting bed.
- .8 Tile shall contact setting materials for minimum of 95% coverage unless otherwise indicated.
- .9 Obtain 100% mortar coverage with applicable requirements for back buttering of tile in referenced TTMAC and ANSI A108/A118/A136.1-20 series of tile installation standards for the following:
 - .1 Tile in wet areas:
 - .1 Showers.
 - .2 Tile installed with chemical resistant mortars and grouts.
 - .3 Tile having any dimension 300 mm (12") or larger in any direction.
 - .4 Tile with raised or textured backs.
 - .5 Tile installation rated for Heavy or Extra Heavy Duty.
 - .6 Porcelain tiles with more than 20% of the tile backs covered with firing release dust back buttered so that 100% of the back is covered with mortar rated for C627, Extra Heavy Duty rating.
- .10 Remove any excess setting material from the joint area so that 2/3 of the depth of the tile is available for grouting.
- .11 Remove smudges or smears of setting material from the tile surface with a damp sponge or cloth immediately after final adjustment and beat-in while the mortar is fresh.
- .12 Do necessary cutting and drilling of fixtures, fittings, and built-in or penetrating units without marring the tile. Replace cracked or damaged tile.
- .13 Extend tile into recesses at windows, doors, or other openings.
- .14 Extend tiles 100 mm (4") behind mirrors, and fully behind cabinets, cupboards and other fixed objects at walls.
- .15 Cut tiles to conform to irregularities in wall lines and vertical planes along outer edges. Smooth cut edges with carborundum block or by other means to provide clean straight edge.
- .16 Install tiles to provide even distribution of shading, colour, and characteristics.

3.9 Control Joints

- .1 Install control joints and expansion joints in tile work in accordance with TTMAC Detail 301MJ-2019-2021 in floors and walls and at perimeters of floors, around columns and where tile abuts other hard materials and or in accordance with the following table:

Environment	Minimum	Maximum	Minimum Joint Width
Interior/Shades	4800 mm	6100 mm	6 mm
Interior/Sunlight	2400 mm	3700 mm	6 mm

Tiling

- .1 Review locations with *Consultant* prior to setting tile and comply with instruction given by *Consultant*.
- .2 Carry substrate control and movements joints through to tile work.
- .3 Cut tiles on both sides along the edges of control joints.
- .4 Sealant control joints: Raking out joints to full depth of tile and cleaning joints for application of sealant in accordance with Section 07 92 00.
- .5 Manufactured control joint trim: in accordance with "Accessories and Related Materials" paragraph.

3.10 Trim Accessories Installation.

- .1 Install trims in accordance with manufacturer's written requirements.
- .2 Install in continuous lengths.
- .3 Scribe and fit to obstructions.
- .4 Mitre corners.
- .5 Tile shall be installed flush with top surface of trim accessory with tolerance of 1 mm (1/32") lower than the top surface of trim accessory. The trim accessory shall not be higher than the tiled surface. A joint of 3 mm (1/8") shall be left between the tile and the profile to be filled with grout.

3.11 Grouting

- .1 Install grout to comply with ANSI A118.4 (ANSI A108/A118/A136.1-20) unless otherwise specified and in accordance with manufacturer's written requirements.
 - .2 Allow tile installation to cure a minimum of 24 hours prior to grouting.
 - .3 Grout joints shall be free of dirt, debris, water or tile spacers and face of tiles are clean.
 - .4 Apply a coat of grout release and achieve 100% surface covered of tile following grout release manufacturer's written requirements.
 - .5 Pack joints full and free of voids/pits.
 - .6 Allow grout joints to become firm. Inspect joint for pinholes/voids and repair them with freshly mixed grout. Within 24 hours, check for remaining haze and remove it with warm soapy water and a nylon scrubbing pad, using a circular motion, to lightly scrub surfaces and dissolve haze/film.
 - .7 Epoxy grout: Install epoxy grout to comply with ANSI A108.1 (ANSI A108/A118/A136.1-20) and ANSI A108.10 (ANSI A108/A118/A136.1-20).
- .1 Grout joint width to be 6 mm (1/4") unless otherwise indicated.
 - .2 Use caution when using sanded grouts to prevent scratching of tile or other material surfaces.
 - .3 Do not cover, bridge or fill any expansion joints in tile with grout.

Tiling

3.12 Tile Installation Tolerances

- .1 Maximum allowable lippage:
 - .1 Tile up to 152 mm x 152 mm (6" x 6") in size: 1 mm (0.040").
 - .2 Tile greater than 152 mm x 152 mm (6" x 6") in size: 2 mm (0.080").
- .2 Finish planes shall be straight and plumb to within 6 mm in 3 m (1/4" in 10 feet).

3.13 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Field tests and inspections:
 - .1 For concrete floor substrates subject to moisture sensitive materials, conduct the following tests in accordance with the following:
 - .1 Test for moisture vapour transmission in accordance with ASTM F710-22 and ASTM F1869-22 or ASTM F2170-19a in accordance with manufacturer's written installation requirements. Results must not exceed the written recommendations of the product manufacturer.
 - .2 Test for surface pH. Levels of pH shall not exceed the written recommendations of the product manufacturer. Test in accordance with ASTM F710-22.
 - .3 For each test type: Conduct 3 tests for flooring applications up to 93 m² (1000 square feet) in area, and 1 additional test for each additional 93 m² (1000 square feet) of flooring area.
 - .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.14 Adjusting and Cleaning

- .1 Clean installed tile surfaces after grouting has cured.
- .2 Re-point joints after cleaning to eliminate imperfections. Avoid scratching tile surfaces.

3.15 Protection

- .1 Protect work of this section against damage by work of other sections for a minimum of 72 hours after application of grouting by prohibiting passage of traffic over tile. Do not immerse in water and protect tilework from freezing for at least 28 days after installation.
- .2 Protect floors from impact and vibration for a minimum of 48 hours after installation.
- .3 Install floor protection in areas where other work, repairs and installation of equipment, and foot traffic will occur.
- .4 Where latex or polymer additives are used in mortar materials, materials shall be cured a minimum of 14 days before exposure to moisture and before water immersion and longer as included in mortar manufacturer's written requirements.

END OF SECTION

Acoustical Tile Ceiling Systems

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Acoustical tile ceiling systems; ACT1, ACT2.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Cooperate with mechanical and electrical *Subcontractors*.
 - .2 Coordinate layout and installation of acoustic ceiling units and suspension systems components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, partition system, fire suppression system components and other work required to be incorporated in or coordinated with the ceiling system.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .2 Submit manufacturer's standard details.
 - .3 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, location of access splines, and acoustical unit support at ceiling fixture.
 - .4 Submit reflected ceiling plans for special grid patterns as indicated.
- .4 Samples:
 - .1 Submit sample of each component of ceiling system. Samples shall fully represent materials to be supplied in colour, texture, finish and construction.
 - .2 Submit samples, load test data and design tables for each type of insert to be used in the *Work* for hanger supports.
- .5 Certificates:
 - .1 Submit certificate of compliance stating that the suspension system provided, including materials and installation, comply with the requirements of the *Contract Documents*.

Acoustical Tile Ceiling Systems

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Maintenance data:
 - .1 Submit maintenance and cleaning instructions for acoustical ceiling systems for incorporation into the maintenance manuals.
- .3 Maintenance materials:
 - .1 Deliver for maintenance use, 5% of each type and colour of suspension components and acoustical tiles used in the *Work*.
 - .2 Pack panels in suitable containers, clearly dated and identified as to type and location of installation in the *Work*, and store where directed by *Owner*.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:
 - .1 Installers: Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
 - .1 Construct in locations acceptable to *Consultant* a typical sample ceiling installation 5.6 m² (60 ft²) in area. Modify sample as directed and as required to obtain approval. Upon acceptance retain sample as standard of quality for acoustical ceiling.
 - .2 Do not begin fabrication and erection of remainder of ceiling system until sample installation has been reviewed and accepted. Accepted sample may become a part of the final *Work*, subject of approval of *Consultant*.

1.6 Delivery, Storage, and Handling

- .1 Ship exposed members and mouldings in rigid crates to avoid damage. Bent or deformed material shall be rejected. Baked enamelled members shall be suitably wrapped and protected against damage.
- .2 Deliver acoustical ceiling units to the *Place of the Work* in original, unopened packages and store in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- .3 Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.
- .4 Handle acoustical ceiling units carefully to avoid chipping edges or damaging units.

1.7 Field Conditions

- .1 Commence installation after building is enclosed with windows and exterior doors in place and glazed, and roof watertight.

Acoustical Tile Ceiling Systems

- .2 Interior temperature of building to range from 15°C to 30°C and relative humidity of not more than 70% before and during installation. Maintain uniform temperatures for 72 hours prior to commencement of the work of this section and maintain temperature until completion of the work of this section.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design suspension systems for a maximum mid-span deflection not exceeding L/360 in accordance with ASTM C635/C635M-22 deflection test.
- .2 Seismic design: Design and install suspended ceiling system to withstand the effects of earthquake motions in accordance with ASTM E580/E580M-22.
- .3 Design suspension system to support safely, and without distortion, the superimposed loads of:
 - .1 Air supply diffusers and return grilles.
 - .2 Lighting fixtures.
- .4 Regulatory Requirements:
 - .1 Fire resistance rated system: Listed by accredited listing agency.

2.2 General

- .1 Single source responsibility: Obtain each type of acoustical ceiling unit and suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the *Work*. Products installed as part of the work of this section shall be from same production run.

2.3 Acoustical Tiles

- .1 ACT 1; Lay-in acoustical tiles:
 - .1 Classification: Type IV, Form 2, Pattern E in accordance with ASTM E1264-22.
 - .2 Size: 610 mm x 1220 mm (24" x 48").
 - .3 Thickness: 19 mm (3/4").
 - .4 NRC: 0.70 minimum.
 - .5 Material: Wet-formed mineral fibre.
 - .6 Surface texture: Fine.
 - .7 Edge: Square lay-in.
 - .8 Colour: White.
 - .9 Flame spread:
 - .1 Maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame Spread Value (FSV): 25.
 - .2 Smoke Developed Value (SDV): 50.

Acoustical Tile Ceiling Systems

- .10 Acceptable *Products*:
 - .1 Armstrong 'Ultima'.
 - .2 Armstrong 'Ultima Health Zone'.
 - .3 USG 'Mars'.
 - .4 Substitutions: in accordance with Section 01 25 00.
- .2 ACT 2; Lay-in acoustical tiles:
 - .1 Classification: Type III, Form 2, Pattern C E in accordance with ASTM E1264-22.
 - .2 Size: 610 mm x 1220 mm (24" x 48").
 - .3 Thickness: 19 mm (3/4").
 - .4 NRC: 0.70.
 - .5 Material: Wet-formed mineral fibre.
 - .6 Surface texture: Medium/lightly.
 - .7 Edge: Square lay-in.
 - .8 Colour: White.
 - .9 Flame spread:
 - .1 Maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame Spread Value (FSV): 25.
 - .2 Smoke Developed Value (SDV): 50.
 - .10 Acceptable *Products*:
 - .1 Armstrong 'School Zone Fine Fissured'.
 - .2 USG 'Radar High NRC'.
 - .3 Substitutions: in accordance with Section 01 25 00.

2.4 Metal Suspension Systems

- .1 Hanger anchorage devices: Screws, clips, bolts, concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3 x calculated load supported except size direct pull-out concrete inserts for 5 x calculated loads.
- .2 Concrete hanger anchors; post installed: Steel eye bolts and nuts to suit ceiling hangers with capability to sustain, without failure, a load equal to 4 times that imposed by ceiling construction, as determined by testing per ASTM E488/E488M-22, conducted by a qualified independent testing laboratory.
 - .1 Dynabolt Sleeve Anchor 'TW-1614' or Readi-Tie-Drive 'TD4-112' tie wire anchor by ITW Ramset/Red Head.
 - .2 Kwik-Bolt III 'HHDCA 1/4' tie wire anchor by Hilti Corporation.

Acoustical Tile Ceiling Systems

- .3 Fasteners exposed to weather, condensation, and corrosion: Zinc-plated or stainless steel fasteners in applicable product lines specified in preceding paragraphs.
- .3 Hangers and tie wire: Galvanized wire, recommended by manufacturer of suspension system, minimum 2.66 mm (0.1") (12 gauge).
- .4 Suspension system accessories:
 - .1 Splices, clips, and perimeter moulding, of manufacturer's standard type to suit the applicable conditions unless special conditions and access area are shown or specified.
 - .2 Hold-down clips; manufacturer's standard type for fire-rated applications.
 - .3 Angle wall mouldings; hemmed with prefinished exposed flanges:
 - .1 For 24 mm (15/16") grid applications; angle moulding with exposed bottom flange of 22 mm (7/8").
 - .1 Armstrong '7803'.
 - .2 CertainTeed 'WA15-15'.
 - .3 CGC 'M7'.
 - .2 For 14 mm (9/16") grid applications; angle moulding with exposed bottom flange of 24 mm (15/16").
 - .1 Armstrong '7804'.
 - .2 CertainTeed 'Wall Angle WA15-9'.
 - .3 CGC 'M9'.
 - .4 Shadow wall mouldings:
 - .1 For 14 mm (9/16") grid applications; angle moulding with exposed bottom flange of 24 mm (15/16").
 - .1 _____.
- .5 Suspension system accessory for continuous lighting:
 - .1 Acceptable *Product*:
 - .1 Armstrong 'TechZone Yoke TZYK'.
- .6 Stepped wall mouldings; hemmed with prefinished exposed flanges:
 - .1 For 24 mm (15/16") grid applications; shadow moulding with exposed bottom flange of 22 mm (7/8") and reveal of 19 mm (3/4").
 - .1 Armstrong '7871'.
 - .2 CertainTeed 'SM1020'.
 - .3 CGC 'MS154'.
 - .2 For 14 mm (9/16") grid applications; shadow moulding with exposed bottom flange of 14 mm (9/16") and reveal of 10 mm (3/8").

Acoustical Tile Ceiling Systems

- .1 Armstrong '7873'.
- .2 CertainTeed 'SM1000'.
- .3 CGC 'MS174'.
- .7 Compression posts: galvanized steel telescoping compression posts to attached to main tees at each splayed wire location preventing upward movement of the ceiling grid system, designed for seismic applications, size to suit ceiling assembly, injection-moulded high impact clip snaps onto main tee for secure positive locking, spring steel top clip attaches to hanger wire, ICBO (International Conference of Building Officials) listed, tested and certified to a minimum compressive load of 408 kg (900 lb); DONN Compression Post as manufactured by CGC Interiors or approved alternative.
- .8 Seismic clips: Ceiling system manufacturer's standard seismic clips designed and spaced to secure tiles in place.
- .5 Standard suspension system, non fire-rated:
 - .1 Heavy duty in accordance with ASTM C635/C635M-22, 24 mm (15/16") interlocking tee system, designed to support acoustical panels in patterns indicated with deflection of main tees less than L/360, consisting of main tees and cross tees. The system shall provide lock joint intersections of cross and main tees.
 - .2 Acceptable *Products*:
 - .1 Armstrong 'Prelude XL 15/16" Exposed Tee Systems'.
 - .2 CertainTeed '15/16" Classic Stab System'.
 - .3 CGC 'DX'.
 - .4 Substitutions: in accordance with Section 01 25 00.
- .6 Narrow suspension system, non fire-rated:
 - .1 Heavy duty in accordance with ASTM C635/C635M-22, 14 mm (9/16") interlocking tee system, designed to support acoustical panels in patterns indicated with deflection of main tees less than L/360, consisting of main tees and cross tees. The system shall provide lock joint intersections of cross and main tees.
 - .2 Acceptable *Products*:
 - .1 Armstrong 'Suprafine XL 9/16" Exposed Tee Systems'.
 - .2 CertainTeed '9/16" Elite Narrow Stab'.
 - .3 Substitutions: in accordance with Section 01 25 00.

2.5 Miscellaneous Materials

- .1 Acoustical sealant: Non-drying, non-hardening, non-skinning, non-staining, non-bleeding, gunnable sealant complying with requirements specified in Section 07 92 00.

Acoustical Tile Ceiling Systems

2.6 Metal Finish

- .1 Metal exposed in finished work shall have a pre-coated baked enamel finish in non-yellowing colour. Submit paint formulation of grid system to lighting fixture, speaker grille, sprinkler and diffuser manufacturers to ensure consistency of colour, sheen and texture of all exposed metal components in the ceiling assemblies.
 - .1 Colour: Flat white.

PART 3 - EXECUTION

3.1 Installation - General

- .1 Install ceiling panels and metal suspension system in accordance with manufacturer's directions. Where manufacturer's directions are at variance with *Contract Documents*, notify *Consultant* before proceeding with installation.
- .2 Do not commence installation until all work above suspended ceiling has been completed, inspected and accepted.

3.2 Installation - Suspension System

- .1 Install suspension system rigid, secure, square, level and plumb, framed and erected to maintain dimensions and contours indicated, and in accordance with ASTM C636/C636M-19, ASTM E580/E580M-22, CISCA installation standards, and any other applicable national or local code requirements. Make allowance for thermal and structural movement.
 - .1 Install acoustical ceiling suspension system to resist seismic disturbance in accordance with ASTM E580/E580M-22.
 - .2 Coordinate work of this section with work of the mechanical and electrical trades for seismic restraint. Install seismic fixture clamps, supplied by Divisions 21, 22, and 23 and Divisions 26, 27, and 28.
- .2 Attach hangers to structure with inserts and hanger supports. Do not use powder activated fasteners.
- .3 Support hangers for suspended ceiling grid independent of walls, columns, pipes and ducts.
- .4 Space hangers for ceilings at maximum 1220 mm (48") on centre in both directions. Provide additional hangers as required to comply with manufacturer's written installation requirements.
- .5 Locate hangers at not more than 150 mm (6") from ends of main tee members.
- .6 Seismic clips: Install seismic clips to secure tiles in place in accordance with ceiling system manufacturer's written requirements.
- .7 Install exposed tee members to pattern indicated. Securely attach hangers to main tee members.
- .8 Exposed tees shall be as long as possible to minimize joints. Make joints square, tight, flush and reinforce with splines. Distribute joints to prevent clustering in one area.

Acoustical Tile Ceiling Systems

- .9 Space tee bars to suit ceiling panels and as detailed, and to accommodate lighting fixtures, diffusers and return grilles.
- .10 Cooperate in the installation of ceiling systems, making adjustments where required to ensure that the lighting fixtures, supply diffusers, exhaust grilles and other built-in items properly fit into ceiling module and finish flush with rest of ceiling.
- .11 Restrict creep inside module panels so that in all cases strips are centred on module lines.
- .12 Install edge moulding as detailed where ceiling abuts vertical surfaces. Lap corners, use maximum lengths to minimize joints. Make joints square, tight and flush.
 - .1 Screw attach mouldings to substrates at intervals not more than 400 mm (16") on centre and not more than 210 mm (8") from ends, levelling with suspension system. Lap corners accurately and connect securely.

3.3 Installation - Tiles

- .1 Take precautions during installation to ensure tile edges are not chipped or otherwise damaged.
- .2 Minimize field cutting. Rectify cut tile edges of tile to match factory cut edge profile and colour.
- .3 Install acoustical tiles to form horizontal and level ceiling with all parts flush and joints butted tightly to hairline appearance.
- .4 Distribute variations in colour and texture of panels to obtain a uniform appearance.

3.4 Installation - Tolerances

- .1 Allowable tolerances: in accordance with ASTM C636/C636M-19.
- .2 Install suspension systems level to tolerance of 1:1200.
- .3 Install edge mouldings level to tolerance of 3 mm in 3660 mm (1/8" in 12'-0").

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

3.6 Adjusting and Cleaning

- .1 Replace uneven, defective or damaged materials and finishes, eliminate waves, remove soiled or stained areas.
- .2 Clean dirty and discoloured surfaces of acoustical units and suspension system according to manufacturer's recommendations.

END OF SECTION

Linear Metal Panels

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Linear metal ceilings (wood-look ceiling planks); CLG-WDLK.
 - .2 Linear metal wall finish.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordination of work: coordinate layout and installation of acoustic ceiling units and suspension systems components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, partition system and fire suppression system components.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint.
 - .2 Indicate lay-out, insert and hanger spacing and fastening details and load calculations, splicing method for main and cross runners, location of light fixtures, diffusers, speakers and other penetrations and finishing items, and connection to building components.
 - .3 Submit reflected ceiling plans.
- .4 Samples:
 - .1 Submit sample of each component of ceiling system. Samples shall fully represent materials to be supplied in colour, texture, finish and construction.
 - .2 Submit 450 mm (18") long sample of metal panel in specified finish.
 - .3 Submit 450 mm (18") long sample of exposed peripheral mouldings and trims in the specified finish.
 - .4 Submit samples, load test data and design tables for each type of insert to be used in the *Work* for hanger supports.
- .5 Certificates:

Linear Metal Panels

- .1 Submit certificate of compliance stating that the suspension system provided, including materials and installation, comply with the requirements of the *Contract Documents*.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Deliver for maintenance use, 5% of each type and colour of suspension components and panels used in the *Work*.
 - .2 Pack panels in suitable containers, clearly dated and identified as to type and location of installation in the *Work*, and store where directed by *Owner*.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
 - .1 Construct in locations acceptable to *Consultant* a typical sample ceiling installation 5.6 m² (60 ft²) in area. Modify sample as directed and as required to obtain approval. Upon acceptance retain sample as standard of quality for linear metal ceiling.
 - .2 Do not begin fabrication and erection of remainder of ceiling system until sample installation has been reviewed and accepted. Accepted sample may become a part of the final *Work*, subject of approval of *Consultant*.

1.6 Delivery, Storage, and Handling

- .1 Ship exposed members and mouldings in rigid crates to avoid damage. Bent or deformed material shall be rejected. Baked enamelled members shall be suitably wrapped and protected against damage.
- .2 Store components in accordance with manufacturer's directions in a fully enclosed dry space protected from moisture, direct sunlight, surface contamination and construction activities.
- .3 Panels shall be protected by a peelable PVC protector. Protector to be removed after installation is complete.
- .4 Handle components in a manner to prevent damage to the surface and edges, and to prevent distortion and other physical damage.

Linear Metal Panels

1.7 Field Conditions

- .1 Commence installation after building is enclosed with windows and exterior doors in place and glazed, and roof watertight, and all wet work and overhead work has been completed.
- .2 Prior to starting installation, allow materials to reach ambient room temperature and humidity intended to be maintained for normal occupancy.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design suspension system to support safely, and without distortion, the superimposed loads of:
 - .1 Air supply diffusers and return grilles.
 - .2 Lighting fixtures.
- .2 Maximum deflection: L/360 in accordance with ASTM C635/C635M-22 deflection test.
- .3 System to be designed and installed to meet Class A requirements for fire performance, with a flame spread index of 25 or less and smoke developed rating of 50 or less when tested in accordance with CAN/ULC-S102-10.
- .4 Coordinate installation and cooperate with mechanical and electrical *Subcontractors*, to accommodate mechanical and electrical items, or any other work required to be incorporated in or coordinated with the ceiling system.

2.2 General

- .1 Single source responsibility: Obtain each type of acoustical ceiling unit and suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the *Work*. Products installed as part of the work of this section shall be from same production run.

2.3 Linear Metal Ceilings (CLG-WDLK)

- .1 Decorative suspended metal wood look ceiling:
 - .1 Description: Perforated face planks, linear pans with reveals, snap-in installation.
 - .2 Spacing: 15.9 mm (5/8") reveal between panels.
 - .3 Panel profile: USG Ceiling Plus Planx.
 - .4 Configuration: as indicated.
 - .5 Panel width: 102 mm (4").
 - .6 Panel length: 2438 mm (96").
 - .7 Perforations: CD04004 with Acoustibond.
 - .8 NRC: 0.60.
 - .9 Acoustical backer: Acoustibond.
 - .10 Filler strip: Manufacturer's standard recessed strip to fill space between panels.

Linear Metal Panels

- .1 Material: Aluminum.
- .2 Colour: Black.
- .11 Finish: Laminate on metal finish (Sarante).
 - .1 Colour: S23N Golden Birch.
- .12 Installation method: Snap-in method, staggered panels.
- .13 Acceptable *Product*:
 - .1 USG 'Ceiling Plus Planx - Linear Metal Suspended Ceiling System'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.4 Linear Metal Wall Panel

- .1 Description: Solid face, no perforations, formed smooth metal wall panel.
- .2 Aluminum flat sheet: Aluminum flat sheet in accordance with ASTM B209/B209M-21a.
- .3 Configuration: as indicated.
- .4 Panel width: to match CLG-WDLK.
- .5 Panel length: to match CLG-WDLK.
- .6 Acoustical backers:
 - .1 Acoustibond.
 - .2 Ultrasorb
- .7 Trims and closures: Butt joint.
- .8 Finish: to match CLG-WDLK.
- .9 Installation system:
 - .1 Manufacturer's standard vertical mounting rail.
- .10 Acceptable *Product*:
 - .1 USG 'Ceiling Plus Wallforms'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.5 Metal Suspension Systems

- .1 Suspension system:
 - .1 Carrier system: Dedicated concealed support systems for linear metal ceilings.
 - .2 Acceptable *Product*:
 - .1 USG 'Planx Main and Cross Tee'.
- .2 Hanger anchorage devices: Screws, clips, bolts, concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3 x calculated load supported except size direct pull-out concrete inserts for 5 x calculated loads.

Linear Metal Panels

- .3 Concrete hanger anchors; post installed: Steel eye bolts and nuts to suit ceiling hangers with capability to sustain, without failure, a load equal to 4 times that imposed by ceiling construction, as determined by testing per ASTM E488/E488M-22, conducted by a qualified independent testing laboratory.
 - .1 Dynabolt Sleeve Anchor 'TW-1614' or Rendi-Tie-Drive 'TD4-112' tie wire anchor by ITW Ramset/Red Head.
 - .2 Kwik-Bolt III 'HHDCA 1/4' tie wire anchor by Hilti Corporation.
 - .3 Fasteners exposed to weather, condensation, and corrosion: Zinc-plated or stainless steel fasteners in applicable product lines specified in preceding paragraphs.
- .4 Hangers: Galvanized wire, recommended by manufacturer of suspension system, minimum 2.66 mm (0.1") (12 gauge).
- .5 Twist clips: *Provide* manufacturer's standard galvanized steel twist clips to connect carriers to hanger wire.
- .6 Carriers/secondary suspension members: U-shaped extruded aluminum, 25 mm (1") high, minimum.
 - .1 Finish: pre-coated baked enamel finish in manufacturer's standard white colour. Submit paint formulation of grid system to lighting fixture, speaker grille, sprinkler and diffuser manufacturers to ensure consistency of colour, sheen and texture of all exposed metal components in the ceiling assemblies.
- .7 Suspension system accessories: Splices, clips, and perimeter moulding and trim, of manufacturer's standard type to suit the applicable conditions unless special conditions and access area are shown or specified.

PART 3 - EXECUTION

3.1 Installation - General

- .1 Do not start installation until exterior glazing has been completed and exterior openings are closed in. Ensure wet work is completed and dried out to a degree acceptable to ceiling panel manufacturer before installation is commenced.
- .2 Install ceiling panels and metal suspension system in accordance with manufacturer's directions. Where manufacturer's directions are at variance with *Contract Documents*, notify *Consultant* before proceeding with installation.
- .3 Do not commence installation until all work above suspended ceiling has been completed, inspected and accepted.

3.2 Installation - Suspension System

- .1 Install suspension system rigid, secure, square, level and plumb, framed and erected to maintain dimensions and contours indicated, and in accordance with ASTM C636/C636M-19, CISCA installation standards and any other applicable national or local code requirements. Make allowance for thermal and structural movement.

Linear Metal Panels

- .2 Attach hangers to structure with inserts and hanger supports. Do not use powder activated fasteners.
- .3 Support hangers for suspended ceiling grid independent of walls, columns, pipes and ducts.
- .4 Space hangers for ceilings at maximum 1220 mm (48") on centre in both directions. Provide additional hangers as required.
- .5 Locate hangers at not more than 150 mm (6") from ends of main tee members.
- .6 Erect suspension systems at required heights and water tube, transit, or laser beam level to tolerance of 1:1200.
- .7 Allowable tolerances: to ASTM C636/C636M-19.
- .8 Design suspension systems for a maximum mid-span deflection not exceeding L/360.
- .9 Cooperate in the installation of ceiling systems, making adjustments where required to ensure that the lighting fixtures, supply diffusers, exhaust grilles and other built-in items properly fit into ceiling module. Install penetrating items such that penetrating items are supported from structure above, independent of ceiling suspension system.
- .10 Restrict creep inside module panels so that in all cases strips are centred on module lines.
- .11 Install edge moulding in accordance with manufacturers requirements and as detailed where ceiling abuts vertical surfaces. Use maximum lengths to minimize joints. Make joints square, tight and flush.
 - .1 Screw attach mouldings to substrates at intervals not more than 400 mm (16") on centre and not more than 210 mm (8") from ends, levelling with suspension system to tolerance of 3 mm in 3660 mm (1/8" in 12'-0"). Lap corners accurately and connect securely.

3.3 Installation - Ceiling Panels

- .1 Install ceiling panels in accordance with manufacturer's requirements and recommendations.
- .2 Install ceiling panels perpendicular to carrier.
- .3 Install ceiling panels and trim pieces with neat, tight joints in accordance with reviewed shop drawings.
- .4 Scribe and cut panels as necessary to fit at borders and other penetrations in accordance with manufacturer's requirements and recommendations.

3.4 Installation – Wall Finish Panels

- .1 Install wall finish panels in accordance with manufacturer's requirements and recommendations.

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

Linear Metal Panels

- .1 Independent inspection and testing company shall perform random load tests for ceiling anchor installation.

3.6 Adjusting and Cleaning

- .1 Carefully examine suspended ceilings on completion and replace uneven or defective or damaged materials, eliminate all waves, remedy damaged exposed finished surfaces and remove soiled, scratched, or stained areas.
- .2 Clean dirty and discoloured surfaces ceiling panels and suspension system according to manufacturer's recommendations.

END OF SECTION

Resilient Base and Accessories

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Resilient base; RB1.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
 - .2 Samples for verification: Submit 1 sample of the following:
 - .1 100 mm (4") long sample of each colour and type of floor transition trims.
- .3 Manufacturer's instructions:
 - .1 Submit manufacturer's installation instructions for *Products* proposed for use in the work of this section.

1.3 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Provide minimum 2% of each colour, pattern and type of resilient base required for this project.
 - .2 Maintenance materials to be same production run as installed materials.
 - .3 Suitably package for protection and storage, each identified with name of manufacturer and material.
 - .4 Tag and store where directed by *Owner*.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

Resilient Base and Accessories

1.5 Field Conditions

- .1 Ambient conditions:
 - .1 Install materials of this section only when surfaces and air temperatures have been maintained between 21°C and 29.4°C for 7 days preceding installation, and will be so maintained during installation and for 48 hours thereafter. Maintain a minimum temperature of 13°C after above period.
 - .2 Verify that adequate ventilation is provided during installation and curing of materials of this section.
 - .3 Applications exposed to intense or direct sunlight, protect *Products* during the conditioning, installation, and adhesive curing periods, by covering the light source.
 - .4 Allow coiled material to lay flat for at least 24 hours at 18°C prior to installation, and maintain this temperature during installation.

PART 2 - PRODUCTS

2.1 General

- .1 Single source responsibility: Obtain each type of resilient *Product* from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the *Work*. Products installed as part of the work of this section shall be from same production run.

2.2 Resilient Base

- .1 Rubber base types:
 - .1 Manufactured from thermoplastic rubber formulation meeting ASTM F1861-16, Type TP.
 - .2 RB1; Rubber base; wall base:
 - .1 Profile: Coved.
 - .2 Height: 100 mm (4") to match existing.
 - .3 Colour: to match Tarkett Charcoal #20.
 - .4 Acceptable *Products*:
 - .1 Forbo 'Wall Base'.
 - .2 Nora 'Rubber Base'.
 - .3 Tarkett 'Duracove Rubber Wall Base', complete with preformed inside and outside corners.

2.3 Accessories

- .1 Block wall filler: Filler type as recommended by resilient base manufacturer to suit substrate and compatible with materials.
- .2 Sealant:

Resilient Base and Accessories

- .1 Medium-modulus, neutral-curing silicone sealant; complying with ASTM C920-11, Type S, Grade NS.
- .2 Colour: Clear.
- .3 Acceptable Manufacturers:
 - .1 Dowsil.
 - .2 Momentive.
 - .3 Tremco.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that field conditions have been provided as requested and specified.
- .2 Substrates shall be firm, structurally sound, sufficiently porous, and dry.
- .3 Examine substrate to ensure clean lines, correct level and freedom from cracks, ridges, dusting, scaling and carbonation.
- .4 Examine substrates in advance of application of products to ensure that substrates are protected against entry of water and moisture.
- .5 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- .6 Failure to call attention to defects or imperfections will be construed as acceptance and approval of the substrate. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.
- .7 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.

3.2 Preparation

- .1 Substrates shall be free of deleterious material that may inhibit bond strength or act as a bond breaker. Remove such contaminants and deleterious material using mechanical methods recommended by manufacturer. Do not use chemical abatement methods.
- .2 Fill gaps, voids, and cracks, and remove ridges, or other defects which will ghost or telegraph through finished product installation.
- .3 Expansion joints, isolation joints, and other movement joints in substrates shall not be filled with patching or levelling compound.
- .4 Sweep and vacuum clean substrates minimum 24 hours prior to alkalinity, moisture, and adhesion testing. Do not use sweeping compounds.
- .5 Notify *Consultant* of any substrate or levelling compound defects or installation conditions that may result in unsatisfactory performance.
- .6 Do not install products until they are same temperature as space where they are to be installed.

Resilient Base and Accessories

- .7 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. Do not use sweeping compounds.
- .8 Where flooring adjoins thicker floor materials, apply levelling screed, feather out to make up difference in level between materials.
- .9 Spray paints, permanent markers and other indelible ink markers shall not be used to write on the back of the resilient material or used to mark the substrate as they could bleed through and permanently stain the resilient material. If such contaminants are present on the substrate they shall be mechanically removed prior to the installation of the resilient material.

3.3 Installation of Resilient Base

- .1 Spread adhesive to ribbed surface (back) of wall base with a 3 mm (1/8") square-notched trowel; allow slight set-up, then bring base into contact with substrate. Ensure full adhesion of base to substrate. Adhesive should cover 80% of back surface. Leave a 6 mm (1/4") uncovered space at the top of the wall base to prevent the adhesive from oozing onto the wall above the base when installed.
- .2 Position wall base on wall surface and roll with hand roller. Always roll back to starting point to prevent stretching the wall base.
- .3 Set base to ensure installation over finished flooring material is free of gaps.
- .4 Install base in longest lengths possible, minimum 2440 mm (8'). Adhere toe of base to substrate, and ensure edge of toe is straight.
- .5 Scribe and fit to door frames and other obstructions.
- .6 Joints shall be tightly fitted, straight and vertical, and not less than 610 mm (24") from corners.
- .7 *Provide* joints in base over substrate control joints.
- .8 Field-made inside corners:
 - .1 Install wall base to terminate into the corner with a mitre cut.
 - .2 Position another piece of wall base on opposing wall, without adhesive, approximately 25 mm (1") from the installed piece.
 - .3 Utilizing the dividers, place the hooked end at the top of the installed piece and the pointer end on the top of the uninstalled piece. Carefully, move the dividers downward in a straight vertical motion, allowing the hooked end of the dividers to follow the profile of the installed piece. At the same time, place adequate pressure on the pointer end to transfer and/or scribe the profile onto the surface of the uninstalled piece.
 - .4 Use a utility knife to cut the pattern on the uninstalled wall base, apply adhesive, and position the trimmed section into place.
- .9 Field-made outside corners:
 - .1 Install wall base to terminate into the corner with a mitre cut.

Resilient Base and Accessories

- .2 Stop application of adhesive to wall base approximately 450 mm (18") from the outside corner of the wall.
- .3 Position the wall base at the corner and pencil line the back of the wall base where the bend is desired.
- .4 Lay the wall base on the floor with the back up. Utilizing a top-set or pull-type gouge tool, make a shallow notch along the pencil line.
- .5 Notch depth should not exceed one-quarter the total thickness of the wall base.
- .6 Reposition the wall base corner on the wall. The corner of the wall should fit snugly into the notched recess on the back of the wall base.
- .7 Apply adhesive and roll firmly into place.

3.4 Installation Tolerances

- .1 Resilient base: Install straight and level to variation of 3 mm (1/8") over 3 m (10'-0").

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

3.6 Adjusting and Cleaning

- .1 Remove adhesive from surfaces as work progresses in manner described by manufacturer.
- .2 Thoroughly clean surfaces in accordance with manufacturer's written requirements.

END OF SECTION

Rubber Sheet Flooring

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Rubber sheet flooring; RSF1.
- .2 Section excludes:
 - .1 RSF2; Static control resilient sheet flooring: in accordance with Section 09 65 36.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Show sheet flooring roll and width layout as related to *Consultant's* floor pattern including borders and accents including where flooring materials meet other floor materials.
 - .2 Show locations of seams, floor drains, floor plates, and where flooring meets other flooring.
- .4 Samples:
 - .1 Selection samples:
 - .1 Submit samples of colours specified for review and approval by *Consultant*.
 - .2 Samples for verification:
 - .1 Flooring: In manufacturer's standard size, but not less than 150 mm (6") x 230 mm (6" x 9") sections of each different colour and pattern of floor covering required.
 - .2 Heat-welding bead: Manufacturer's standard-size samples, but not less than 230 mm (9") long, of each colour required.
 - .3 Transition trim: Manufacturer's standard size samples, but not less than 100 mm (4") long, of each colour required.

Rubber Sheet Flooring

- .4 Seam samples: For each floor covering product, colour, pattern, and seam required, installer shall *Provide* a 150 mm x 230 mm (6" x 9") sample directly applied to a rigid backing material with the seam running lengthwise and in the center of the sample.
- .5 Test and evaluation reports:
 - .1 Submit moisture, alkalinity, and adhesive bond test results.
- .6 Manufacturer's instructions:
 - .1 Submit manufacturer's installation instructions for *Products* proposed for use in the work of this section.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Submit 2% of each colour in full running length, pattern and type flooring material required for this project for maintenance use.
 - .2 Maintenance materials to be same production run as installed materials.
 - .3 Suitably package for protection and storage, each identified with name of manufacturer and flooring material.
 - .4 Tag and store where directed by *Owner*.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
 - .1 Prior to commencing flooring installation for this section, prepare full room mock-up (room size at least 10 m² (100 ft²) in area) for acceptance by the *Consultant*.
 - .2 Mock-up shall include flooring showing edge treatment and relationships to adjoining surfaces.
 - .3 Location of installation shall be determined by *Consultant*.
 - .4 Do not proceed with flooring specified in this section in areas impacted by the raised floor on L3 until mock-up has been accepted by *Contractor* and *Consultant*.

Rubber Sheet Flooring

1.6 Field Conditions

- .1 Ambient conditions:
 - .1 Install materials of this section only when surfaces and air temperatures have been maintained between 18.4°C and 29.4°C for 48 hours preceding installation, and will be so maintained during installation and for 48 hours thereafter. Maintain a minimum temperature of 13°C after above period. Relative humidity shall be 50 +/- 10%.
 - .2 Ensure that adequate ventilation is provided during installation and curing of materials of this section.
 - .3 In areas that are exposed to intense or direct sunlight, *Products* shall be protected during the conditioning, installation, and adhesive curing periods, by covering the light source.
 - .4 Allow products to acclimatize in installation area for a minimum 24 hour prior to installation.

1.7 Delivery, Storage, and Handling

- .1 Package flooring materials and identify contents of each package.
- .2 Store materials for a minimum of 24 hours immediately before installation to comply with temperatures specified under Field Conditions.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Flooring material static coefficient of friction: Minimum 0.80 (Neolite dry) as determined in accordance with ASTM D2047
- .2 Rubber sheet flooring shall not:
 - .1 Become stained or discoloured due to slab markings.
 - .2 Delaminate from substrates.
 - .3 Have welded seams which separate.

2.2 General

- .1 Single source responsibility: Obtain each *Product* from a single source with resources to provide products of consistent quality in appearance and physical properties, same production run. Products installed as part of the work of this section shall be from same production run.

2.3 Rubber Sheet Flooring

- .1 RSF1:
 - .1 Prefabricated resilient rubber flooring: in accordance with ASTM F1859, Type I.
 - .2 Thickness: 3 mm (0.11").

Rubber Sheet Flooring

- .3 Surface texture: Smooth.
- .4 Colours:
 - .1 RSF1a: to match Harmoni HG502 Greyhound.
 - .2 RSF1b: to match Harmoni HG485 Palette.
 - .3 RSF1c: to match Harmoni HG510 Dianthus.
 - .4 RSF1d: to match Harmoni HG498 Korat.
 - .5 RSF1e: to match Harmoni HG501 Rain.
- .5 Acceptable *Products*:
 - .1 Mondo 'Harmoni'.
 - .2 Nora 'Noraplan Envirocare'.
 - .3 Substitutions: in accordance with Section 01 25 00.

2.4 Miscellaneous Materials

- .1 Seam construction:
 - .1 Hot welded joints: provide welding rod matched to floor pattern/colour selected.
 - .2 Colours: To later selected by *Consultant* from full colour range.
- .2 Primers and adhesives:
 - .1 Types as recommended by resilient flooring manufacturer compatible with materials and to suit substrate types and to comply with warranty requirements and as noted below for epoxy polyurethane adhesives where indicated.
 - .2 Provide epoxy-polyurethane where indicated on drawings:
 - .1 Acceptable Product:
 - .1 Basis of Design: Mondo 'PU 300'
- .3 Patching and levelling compound:
 - .1 Trowel applied Portland cement based, moisture, mildew, and alkali-resistant.
 - .2 Minimum compressive strength after 28 days shall be minimum 3,500 psi when tested in accordance with ASTM C109 or ASTM C472.
 - .3 Gypsum based compounds are not acceptable.
 - .4 Acceptable manufacturers:
 - .1 Ardex.
 - .2 Mapei.
 - .3 Substitutions: in accordance with Section 01 25 00.
 - .5 Acceptable *Product*: type as recommended by flooring manufacturer for existing substrate conditions.
- .4 Cleaning solution:

Rubber Sheet Flooring

- .1 Acceptable *Products*: type as recommended by flooring manufacturer.
- .5 SCB1; Prefabricated flash cove base:
 - .1 Acceptable manufacturer:
 - .1 FlashCove Prefabricated Bases Inc.
 - .2 Description: 3 m (10') factory fabricated lengths, with puncture resistant aluminium reinforcing attached through the cove radius, using project specific sheet flooring in run to match specified flooring material and colours.
 - .3 Riser: 150 mm (6") riser with 75 mm (3") toe.
 - .4 Cove cap:
 - .1 Stainless steel "chiklet" cap, adhered in place at time of cove installation. Distributed by FlashCove Prefabricated Bases Inc.
- .6 Floor transition strips:
 - .1 Resilient transition trims:
 - .1 Acceptable *Product*:
 - .1 Tarkett 'VT-XX-M6', 1-3/4" exposed surface threshold.
 - .1 Colours:
 - .1 RSF1b: 22 Pearl.
 - .2 RSF1d: 48 Grey.
 - .3 RSF2a: 24 Grey Haze
 - .2 Metal transition trim:
 - .1 Acceptable *Product*:
 - .1 Schluter 'Schiene-E', stainless steel E30.
- .7 Expansion/movement joint:
 - .1 Acceptable *Product*:
 - .1 Schluter Systems 'DILEX-EKSB'.
 - .1 Finish: Stainless steel colour to later selection by *Consultant*.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .8 Sealant: Mildew resistant sealant in accordance with Section 07 92 00.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that field conditions have been provided as requested and specified.
- .2 Verify that substrates have been provided as specified without holes, protrusions, cracks greater than 1.6 mm (0.06") wide, unfilled control joints, depressions greater than 3 mm (1/8") deep, or other major defects.

Rubber Sheet Flooring

- .3 Substrates shall be firm, structurally sound, sufficiently porous, and dry.
- .4 Examine substrate to ensure clean lines, correct level and freedom from cracks, ridges, dusting, scaling and carbonation.
- .5 Examine floors in advance of application of flooring to ensure that floors are protected against entry of water and moisture. Perform compatibility test with primer/adhesive and substrate.
- .6 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- .7 Failure to call attention to defects or imperfections will be construed as acceptance and approval of the substrate. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.
- .8 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.

3.2 Preparation

- .1 Comply with recommendations of ASTM F710-22.
- .2 Substrates shall be free of wax, oil, silicone, soap, grease, dust, solvents, sealers, curing compounds, hardeners, alkaline salts, excessive carbonation or laitance, mould, mildew, paints, varnish, asphalt, residual adhesives, adhesive removers, or other contaminants or deleterious material that may inhibit bond strength or act as a bond breaker. Remove such contaminants and deleterious material using mechanical methods recommended by manufacturer. Do not use chemical abatement methods.
- .3 Concrete substrates that are loose, sandy, scaly, or have a white powdery surface are not acceptable. Substrates shall be mechanically prepared.
- .4 Flooring substrates shall be smooth and level within a tolerance of 3 mm (1/8") in a 3 m (10'-0") radius.
- .5 Fill surface cracks, holes, score marks, depressions, and grooves, and repair surface spalls with Portland cement patching or levelling compound.
- .6 At door opening locations where finished flooring is adjacent to weather-stripping or automatic door bottoms provide trowel-applied levelling compound to provide full contact between finished flooring and weather-stripping or automatic door bottoms. Taper trowel-applied levelling compound to transition with adjacent flooring substrate to provide smooth and seamless transition at maximum slope of 3:1000 (height to distance) ratio.
- .7 Expansion joints, isolation joints, and other movement joints in substrates shall not be filled with patching or levelling compound.
- .8 Remove bumps, high spots, peaks and ridges to produce a uniform and smooth substrate.
- .9 Prepare substrates so that installation of flooring shall not show telegraphing of substrate.
- .10 Remove chalking and dusting and loose material from concrete surfaces with wire brushed or by scraping.
- .11 Sweep and vacuum clean substrates minimum 24 hours prior to alkalinity, moisture, and adhesion testing. Do not use sweeping compounds.

Rubber Sheet Flooring

- .12 Notify *Consultant* of any substrate or levelling compound defects or installation conditions that may result in unsatisfactory performance.
- .13 Prepared concrete substrate shall have a finish equivalent to a magnesium trowel finish. Shiny, slick, non-porous, or overly porous substrates are not acceptable and shall require additional preparation prior to installation of flooring products. Prepared concrete substrates shall have a Concrete Surface Profile #3 to #5 in accordance with International Concrete Repair Institute (ICRI).
 - .1 Substrate to be approved in writing by flooring manufacturer prior to application of flooring.
 - .2 Submit written report to *Consultant* following procedures for manufacturer's field review in accordance with Section 01 45 00.
- .14 Alkalinity, moisture, and adhesion testing:
 - .1 Test substrates in accordance with paragraph 3.6 Field Quality Control after mechanically preparing subfloor or applying patching and levelling compounds.
 - .2 Proceed with installation only after substrates pass testing. Document tests performed and submit in writing to *Consultant*.
- .15 Do not install floor coverings until they are same temperature as space where they are to be installed.
 - .1 Move floor coverings and installation materials to acclimatize in spaces where they will be installed at least 48 hours in advance of installation.
- .16 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. Do not use sweeping compounds.
- .17 Where flooring adjoins thicker floor materials, apply levelling screed, feather out to make up difference in level between materials to achieve flush floor finish between adjacent flooring materials unless otherwise indicated.
- .18 Spray paints, permanent markers and other indelible ink markers shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and permanently stain the flooring material. If such contaminants are present on the substrate they shall be mechanically removed prior to the installation of the flooring material.

3.3 Flooring Installation

- .1 Apply adhesive uniformly and install flooring in accordance with flooring manufacturer's requirements. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .2 Allow material to relax unrolled overnight, minimum 12 hours in installation areas.
- .3 Install rolls and cuts in sequence following manufacturer's installation requirements/diagrams.
 - .1 Lay flooring with joints parallel to building lines to produce symmetrical pattern and minimum joints.

Rubber Sheet Flooring

- .2 Place seams in inconspicuous and low-traffic areas, at least 150 mm (6") away from parallel joints in levelling underlayment, concrete joints, saw cuts and other type of joints.
- .3 Avoid cross seams.
- .4 Lay sheet flooring centered in corridors, with equal sized sheet to either side of center sheet.
- .5 Mitre intersections at corridors typically. "T" type corridors shall be butt type installation.
- .6 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.
- .7 Layout seaming uniformly, using full length flooring typically, minimum flooring size of not less than roll width. Limit quantity of less than full length floor pieces at corridors to maximum of 1.
- .8 Layout flooring to match reviewed shop drawings floor pattern including borders and accents.
- .9 Match edges of floor coverings for colour shading at seams.
- .4 Cutting and fitting sheets:
 - .1 Cut pieces to length allowing approximately 75 mm (3") to 150 mm (6") excess for trimming.
 - .2 Cut sheet and fit neatly around fixed objects without gaps.
 - .3 Install one sheet at a time in wet adhesive.
 - .4 Roll the flooring immediately in both directions using 45 kg (100 lb) three-section roller.
- .5 As installation progresses, roll flooring with 75 kg (165 lb) roller to ensure full adhesion, remove adhesive ridges, and entrapped air.
- .6 Where cove base is not required, seal joint at wall with manufacturer's approved sealant.
- .7 Apply adhesive uniformly and at spreading rates in accordance with adhesive manufacturer's requirements. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .8 Obtain 100% adhesive coverage to flooring backing.
- .9 Install flooring to entire area indicated or scheduled, including coverplates occurring within finished floor areas. Maintain overall continuity of colour and pattern with pieces of flooring installed on cover plates. Tightly butt edges to perimeter of floor around cover plates and to cover plates. Cut flooring to floor drains occurring within finished floor
- .10 Heat-welded seams:
 - .1 Weld seams in accordance with ASTM F1516-13(2018).
 - .2 Wait minimum of 24 hours after flooring installation before grooving and heat welding seams.

Rubber Sheet Flooring

- .3 Prepare, weld, and trim seams to produce flat surfaces flush with adjoining floor covering surfaces.
- .4 Rout joints to approximately 2/3 of the thickness of the material and use welding bead to permanently fuse sections into a seamless floor covering. Groove shall be between 3 mm (0.118") and 3.5 mm (0.138") wide.
- .5 Using a weld plate and skiving knife to make first cut and allow weld rod to fully cure to room temperature.
- .6 Using a skiving knife only, finish the trimming of the remainder of the weld. The finish should be smooth and on the same level as the flooring.
- .7 Trimming of welded joint while warm is not permitted unless final trimming is performed after weld has cooled to flooring temperature. Excess weld shall be removed using a heated standard putty knife.
- .8 Roll the seam area with 45 kg (100 lb) three-section roller.
- .9 Maximum variation of welds from plane or from straight: 6 mm (1/4") in 3 m (10 ft) length using a 3 m (10 ft) straight edge.
- .11 Flooring installation shall not show telegraphing of substrate. Flooring installation shall be homogenous free of substrate lines, pockets, bumps and unevenness.

3.4 Prefabricated Flash Cove Base Installation

- .1 Butt joints to be square cut; inside and outside corners to be mitre cut on site using appropriate power mitre saw. Joints to be seam welded according to manufacturer's requirements.
- .2 Seal ends of cove, where the cove meets a doorframe, walls, and other surfaces with colour matched sealant.
- .3 Scribe and fit to door frames and other obstructions.
- .4 Joints shall be tightly fitted, straight and vertical, and not less than 610 mm (24") from corners.
- .5 *Provide* joints in base over substrate control joints.

3.5 Installation - Transition Trim

- .1 Protect exposed edges of flooring, where finished and unfinished areas adjoining, by means of a transition trim butting to and flush with the finished surface of the flooring covering material and securely adhered to the substrate material.
- .2 Coordinate transitions with work of other sections.
- .3 Allow coiled vinyl material to lay flat for at least 24 hours at ambient temperatures specified above prior to installation.
- .4 Set to ensure installation is free of gaps.
- .5 Install in longest lengths possible.
- .6 Install straight to maximum allowable variation of 3 mm (1/8") over 3 m (10'-0").

Rubber Sheet Flooring

- .7 Scribe and fit to obstructions.
- .8 Fit joints tightly, straight and vertical as applicable and not less than 610 mm (24") from corners.
- .9 Cope mitre corners.

3.6 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and as follows:
 - .1 Field tests and inspections:
 - .1 Moisture and alkalinity:
 - .1 Test for moisture vapour transmission in accordance with ASTM F710-22 and ASTM F1869-22 or ASTM F2170-19a in accordance with manufacturer's written flooring installation requirements. Results must not exceed 170 $\mu\text{g}/\text{m}^2$ (3 lb per 1,000 ft^2) in 24 hours when tested to ASTM F1869-22, or exceed 75% when tested to ASTM F2170-19a.
 - .2 Test for surface pH. Levels of pH shall not exceed the written recommendations of the flooring manufacturer and adhesive manufacturer. Test in accordance with ASTM F710-22.
 - .3 For each test type: Conduct 3 tests for flooring applications up to 93 m^2 (1000 ft^2) in area, and 1 additional test for each additional 93 m^2 (1000 ft^2) of flooring area.
 - .4 Testing shall be conducted by independent inspection and testing company and in accordance with Section 01 45 00.
 - .2 Adhesion bond test:
 - .1 Perform bond tests with specified products to confirm suitability and strong adhesion to the substrate, per ASTM F3311 (mat bond evaluation).
 - .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.7 Adjusting and Cleaning

- .1 Remove excess adhesive from surfaces of the sheet flooring and base as work progresses.
- .2 Thoroughly clean surfaces in accordance with manufacturer's recommendations.

3.8 Protection

- .1 Prohibit foot traffic on installed flooring for a period of 24 hours after installation. No heavy traffic, rolling loads, or furniture placement are permitted for a minimum of 72 hours after installation.
- .2 Protect new floors from time of final set of adhesive until final inspection.
- .3 Install floor protection in areas where work, repairs and installation of equipment, and foot traffic will occur.

Rubber Sheet Flooring

3.9 Maintenance

- .1 Perform initial maintenance according to the manufacturer's written requirements.
- .2 Allow flooring to dry prior to applying protection.

END OF SECTION

Static Control Resilient Flooring

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Static control resilient sheet flooring; RSF2.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
 - .1 Independent inspection and testing company shall attend the pre-installation meeting.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Show sheet flooring roll and width layout as related to *Consultant's* floor pattern including borders and accents including where flooring materials meet other floor materials.
 - .2 Show locations of seams, floor drains, floor plates, and where flooring meets other flooring.
- .4 Samples:
 - .1 Selection samples:
 - .1 Submit manufacturer's range of pattern and colours available for *Consultant's* selection.
 - .2 Sheet flooring in manufacturer's standard size, but not less than 150 mm x 230 mm (6" x 9") sections of each different color and pattern of floor covering required.
 - .3 Heat-welding bead: Manufacturer's standard-size samples, but not less than 230 mm (9") long, of each colour required.
 - .4 Transition trim: Manufacturer's standard size samples, but not less than 100 mm (4") long, of each colour required.
 - .5 Seam samples: For each floor covering product, colour, pattern, and seam required, installer shall *Provide* a 150 mm x 230 mm (6" x 9") sample directly applied to a rigid backing material with the seam running lengthwise and in the center of the sample.
- .5 Test and evaluation reports:

Static Control Resilient Flooring

- .1 Submit moisture, alkalinity, and adhesive bond test results.
- .6 Manufacturer's instructions:
 - .1 Submit manufacturer's installation instructions for *Products* proposed for use in the work of this section.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Submit for each colour in full running length, pattern and type flooring material required for this project for maintenance use, as follows:
 - .1 Provide 5000 mm (16.4 ft) length for colours/pattern less than 75 m² (807 ft²).
 - .2 Provide 10 m (33 ft) length for colours/pattern more than 75 m² (807 ft²).
 - .2 Maintenance materials to be same production run as installed materials.
 - .3 Suitably package for protection and storage, each identified with name of manufacturer and flooring material.
 - .4 Tag and store where directed by *Owner*.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
 - .1 Prior to commencing flooring installation for this section, prepare full room mock-up (inside Security Room 3452) for acceptance by the *Consultant*.
 - .2 Mock-up shall include flooring showing edge treatment and relationships to adjoining surfaces.
 - .3 Location of installation shall be determined by *Consultant*.
 - .4 Do not proceed with flooring specified in this section until mock-up has been accepted by *Contractor* and *Consultant*.

1.6 Delivery, Storage, and Handling

- .1 Package flooring materials and identify contents of each package.

Static Control Resilient Flooring

- .2 Store materials for a minimum of 24 hours immediately before installation to comply with temperatures specified under Field Conditions.
- .3 Store flooring rolls on end.

1.7 Field Conditions

- .1 Ambient conditions:
 - .1 Install materials of this section only when surfaces and air temperatures have been maintained between 18.4°C and 29.4°C for 48 hours preceding installation, and will be so maintained during installation and for 48 hours thereafter. Maintain a minimum temperature of 13°C after above period. Relative humidity shall be 50 +/- 10%.
 - .2 Verify that adequate ventilation is provided during installation and curing of materials of this section.
 - .3 In areas that are exposed to intense or direct sunlight, *Products* shall be protected during the conditioning, installation, and adhesive curing periods, by covering the light source.
 - .4 Allow products to acclimatize in installation area for a minimum 24 hour prior to installation.

PART 2 - PRODUCTS

2.1 General

- .1 Single source responsibility: Obtain each type of tile flooring including from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the *Work*. Products installed as part of the work of this section shall be from same production run.

2.2 Performance/Design Requirements

- .1 Slip resistance: Floors shall have a wet Dynamic Coefficient of Friction (DCOF) of 0.42 or greater in accordance with ANSI A326.3.
- .2 Static dissipative flooring: in accordance with ASTM F150, average reading of no less than 10⁶ Ohms and no greater than 10⁹ Ohms.
- .3 Resilient flooring shall not:
 - .1 Become stained or discoloured due to slab markings.
 - .2 Delaminate from substrates.
 - .3 Have welded seams which separate.

2.3 Static Control Sheet Flooring; RSF2

- .1 Thickness: 3 mm (0.11").
- .2 Colour:
 - .1 RSF2a: HG493 Sand.

Static Control Resilient Flooring

.3 Acceptable *Products*:

- .1 Mondo 'Harmoni Static Dissipative'.
- .2 Substitutions: in accordance with Section 01 25 00.

2.4 Miscellaneous Materials

- .1 Primers: Type as recommended by flooring manufacturer compatible with materials and to suit substrate types.
- .2 Adhesives:
 - .1 For conductive static dissipative application: Adhesive and grounding strips in accordance with manufacturer's installation requirements.
- .3 Patching and levelling compound:
 - .1 Trowel applied Portland cement based, moisture, mildew, and alkali-resistant.
 - .2 Minimum compressive strength after 28 days shall be minimum 3,500 psi when tested in accordance with ASTM C109/C109M-21.
 - .3 Gypsum based compounds are not acceptable.
 - .4 Acceptable manufacturers:
 - .1 Ardex.
 - .2 Mapei.
 - .3 Substitutions: in accordance with Section 01 25 00.
 - .5 Acceptable *Product*: type as recommended by flooring manufacturer for substrate conditions.
- .4 Cleaning, sealer, and polish/floor finish materials: Institutional grade as recommended by flooring manufacturer to suit product types and user requirements.
- .5 SCB1; Prefabricated flash cove base:
 - .1 Acceptable manufacturer:
 - .1 FlashCove Prefabricated Bases Inc.
 - .2 Description: 3 m (10') factory fabricated lengths, with puncture resistant aluminium reinforcing attached through the cove radius, using project specific sheet flooring in run to match specified flooring material and colours.
 - .3 Riser: 150 mm (6") riser with 75 mm (3") toe.
 - .4 Cove cap:
 - .1 Stainless steel "chiklet" cap, adhered in place at time of cove installation. Distributed by FlashCove Prefabricated Bases Inc.
 - .2 Vinyl or rubber cove cap installed as per manufacturer's recommendations.
 - .5 Metal transition trim:
 - .1 Acceptable *Product*:

Static Control Resilient Flooring

- .1 Schluter 'Schiene-E', stainless steel E30.
- .6 Sealant: Mildew resistant sealant in accordance with Section 07 92 00.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that field conditions have been provided as requested and specified.
- .2 Verify that substrates have been provided as specified without holes, protrusions, cracks greater than 1.6 mm (0.06") wide, unfilled control joints, depressions greater than 3 mm (1/8") deep, or other major defects.
- .3 Substrates shall be firm, structurally sound, sufficiently porous, and dry.
- .4 Examine substrate to ensure clean lines, correct level and freedom from cracks, ridges, dusting, scaling and carbonation.
- .5 Examine floors in advance of application of flooring to ensure that floors are protected against entry of water and moisture.
- .6 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- .7 Failure to call attention to defects or imperfections will be construed as acceptance and approval of the substrate. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.
- .8 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.

3.2 Preparation

- .1 Comply with recommendations of ASTM F710-22.
- .2 Substrates shall be free of wax, oil, silicone, soap, grease, dust, solvents, sealers, curing compounds, hardeners, alkaline salts, excessive carbonation or laitance, mould, mildew, paints, varnish, asphalt, residual adhesives, adhesive removers, or other contaminants or deleterious material that may inhibit bond strength or act as a bond breaker. Remove such contaminants and deleterious material using mechanical methods recommended by manufacturer. Do not use chemical abatement methods.
- .3 Concrete substrates that are loose, sandy, scaly, or have a white powdery surface are not acceptable. Substrates shall be mechanically prepared.
- .4 Flooring substrates shall be smooth and level within a tolerance of 3 mm (1/8") in a 3 m (10'-0") radius.
- .5 Fill surface cracks, holes, score marks, depressions, and grooves, and repair surface spalls with Portland cement patching or levelling compound.

Static Control Resilient Flooring

- .6 At door opening locations where finished flooring is adjacent to weather-stripping or automatic door bottoms provide trowel-applied levelling compound to provide full contact between finished flooring and weather-stripping or automatic door bottoms. Taper trowel-applied levelling compound to transition with adjacent flooring substrate to provide smooth and seamless transition at maximum slope of 3:1000 (height to distance) ratio.
- .7 Expansion joints, isolation joints, and other movement joints in substrates shall not be filled with patching or levelling compound.
- .8 Remove bumps, high spots, peaks and ridges to produce a uniform and smooth substrate.
- .9 Prepare substrates so that installation of flooring shall not show telegraphing of substrate.
- .10 Remove chalking and dusting and loose material from concrete surfaces with wire brushed or by scraping.
- .11 Sweep and vacuum clean substrates minimum 24 hours prior to alkalinity, moisture, and adhesion testing. Do not use sweeping compounds.
- .12 Notify *Consultant* of any substrate or levelling compound defects or installation conditions that may result in unsatisfactory performance.
- .13 Prepared concrete substrate shall have a finish equivalent to a magnesium trowel finish. Shiny, slick, non-porous, or overly porous substrates are not acceptable and shall require additional preparation prior to installation of flooring products. Prepared concrete substrates shall have a Concrete Surface Profile #3 to #5 in accordance with International Concrete Repair Institute (ICRI).
 - .1 Substrate to be approved in writing by flooring manufacturer prior to application of flooring.
 - .2 Submit written report to *Consultant* following procedures for manufacturer's field review in accordance with Section 01 45 00.
- .14 Alkalinity, moisture, and adhesion bond testing:
 - .1 Test substrates in accordance with paragraph 3.9 Field Quality Control after mechanically preparing subfloor or applying patching and levelling compounds.
 - .2 Proceed with installation only after substrates pass testing. Document tests performed and submit in writing to *Consultant*.
- .15 Do not install floor coverings until they are same temperature as space where they are to be installed.
 - .1 Move floor coverings and installation materials to acclimatize in spaces where they will be installed at least 48 hours in advance of installation.
- .16 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. Do not use sweeping compounds.
- .17 Where flooring adjoins thicker floor materials, apply levelling screed, feather out to make up difference in level between materials to achieve flush floor finish between adjacent flooring materials unless otherwise indicated.

Static Control Resilient Flooring

- .18 Spray paints, permanent markers and other indelible ink markers shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and permanently stain the flooring material. If such contaminants are present on the substrate they shall be mechanically removed prior to the installation of the flooring material.
- .19 Allow material to relax unrolled overnight, minimum 12 hours in installation areas.
- .20 Obtain 100% adhesive coverage to flooring backing.

3.3 Sheet Flooring Installation

- .1 Before commencing installation, verify product type, size, thickness, and colour. Do not install flooring with visual imperfections, colour variations or apparent defects.
- .2 Lay flooring with joints parallel to building lines unless otherwise indicated or scheduled.
- .3 Cut flooring and fit neatly around fixed objects without gaps.
- .4 Install rolls in the same area from the same dye lot number. Install rolls in numerical order according to sequence number. Reverse sheet during installation unless otherwise instructed in manufacturer's installation requirements.
- .5 Unroll material in the same direction and follow the flooring manufacture's numbered sequence/layout diagram.
 - .1 Lay flooring with joints parallel to building lines to produce symmetrical pattern and minimum joints.
 - .2 Place seams in inconspicuous and low-traffic areas, at least 150 mm (6") away from parallel joints in floor covering substrates.
 - .3 Avoid cross seams.
 - .4 Lay sheet flooring centered in corridors, with equal sized sheet to either side of center sheet.
 - .5 Mitre intersections at corridors typically. "T" type corridors shall be butt type installation.
 - .6 Layout seaming uniformly, using full length flooring typically, minimum flooring size of not less than roll width. Limit quantity of less than full length floor pieces at corridors to maximum of 1.
 - .7 Layout flooring to match reviewed shop drawings floor pattern including borders and accents.
 - .8 Match edges of floor coverings for colour shading at seams.
- .6 Allow material to relax overnight, minimum 12 hours.
- .7 Cutting and fitting sheets:
 - .1 Seams shall be a minimum of 150 mm (6") away from levelling underlayment and concrete joints, saw cuts and other type of joints.
 - .2 Cut sheet and fit neatly around fixed objects without gaps.

Static Control Resilient Flooring

- .8 Apply adhesive uniformly. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .9 Copper grounding strips:
 - .1 Install continuous copper grounding strips into conductive adhesive in accordance with manufacturer's written requirements, without electrical breaks.
 - .2 Coordinate grounding strip terminations with grounding connection, in accordance with reviewed shop drawings.
- .10 Obtain 100% adhesive coverage to flooring backing.
- .11 Install flooring to entire area indicated or scheduled, including coverplates occurring within finished floor areas. Maintain overall continuity of colour and pattern with pieces of flooring installed on cover plates. Tightly butt edges to perimeter of floor around cover plates and to cover plates. Cut flooring to floor drains occurring within finished floor areas.
- .12 Heat welding:
 - .1 Perform grooving and heat welding of sheet flooring joints in accordance with manufacturer's installation requirements.
 - .2 After the adhesive has set, groove the seams with a power or hand-grooving tool. Adjust it to cut a V-shaped groove 2/3 of the tile thickness. Groove, weld, and trim the tiles in one direction at a time.
 - .3 Vacuum to remove dust and deleterious materials. Using a heat-welding gun, insert the heat-welding rod into the welding nozzle and preheat the gun. Conduct a trial weld on a scrap piece of material. Weld the seams in one direction at a time. Welding temperature shall fall into the temperature range of 350°C to 400°C
 - .4 When the weld is cool, remove the excess welding bead using tools as recommended by sheet flooring manufacturer. Make the finishing trim using a sharp crescent knife. At an angle between 10° and 20°.
- .13 As installation progresses, roll sheet with polished, clean 45 kg (100 lb) roller to ensure full adhesion. Telegraphing of adhesive marks not permitted.
- .14 Terminate flooring at centerline of door in openings where there is an adjacent floor finish or colour is dissimilar unless otherwise indicated or scheduled.
- .15 Centreline of transition should coincide with centreline of door.
- .16 Flooring installation shall not show telegraphing of substrate. Flooring installation shall be homogenous free of substrate lines, pockets, bumps and unevenness.

3.4 Prefabricated Flash Cove Base Installation

- .1 Butt joints to be square cut; inside and outside corners to be mitre cut on site using appropriate power mitre saw. Joints to be seam welded according to manufacturer's requirements.
- .2 Seal ends of cove, where the cove meets a doorframe, walls, and other surfaces with colour matched sealant.
- .3 Scribe and fit to door frames and other obstructions.

Static Control Resilient Flooring

- .4 Joints shall be tightly fitted, straight and vertical, and not less than 610 mm (24") from corners.
- .5 *Provide* joints in base over substrate control joints.

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Field tests and inspections:
 - .1 Moisture and alkalinity:
 - .1 Test for moisture vapour transmission in accordance with ASTM F710-22 and ASTM F1869-22 or ASTM F2170-19a in accordance with manufacturer's written flooring installation requirements. Results must not exceed 170 µg/m² (3 lb per 1,000 ft²) in 24 hours when tested to ASTM F1869-22, or exceed 75% when tested to ASTM F2170-19a.
 - .2 Test for surface pH. Levels of pH shall not exceed the written recommendations of the flooring manufacturer and adhesive manufacturer. Test in accordance with ASTM F710-22.
 - .3 For each test type: Conduct 3 tests for flooring applications up to 93 m² (1000 ft²) in area, and 1 additional test for each additional 93 m² (1000 ft²) of flooring area.
 - .4 Testing shall be conducted by independent inspection and testing company and in accordance with Section 01 45 00.
 - .2 Adhesion bond test:
 - .1 Proceed with bond test after substrates have been prepared and alkalinity and moisture test have been completed.
 - .2 Select four substrate test areas, each 915 mm (3'-0") x 915 mm (3'-0") in size. Test areas shall be spaced a minimum 1220 mm (48") apart.
 - .3 Cut 915 mm (3'-0") x 915 mm (3'-0") panels from specified material.
 - .4 Using the specified adhesive, glue down each panel using adhesive manufacturer's recommended trowel.
 - .5 After 72 hours, attempt to remove the panels of flooring by pulling up from the corners.
 - .3 Test flooring installation for electrical resistance in accordance with manufacturer's written requirements. Make 5 measurements within 93°sq m (1000°sq ft) area. Perform testing by flooring manufacturer's representative, with *Consultant* present.
 - .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.6 Adjusting and Cleaning

- .1 Remove excess adhesive from surfaces of the sheet flooring and base as work progresses.

Static Control Resilient Flooring

- .2 Thoroughly clean surfaces in accordance with manufacturer's recommendations.

3.7 Protection

- .1 Prohibit foot traffic on installed flooring for a period of 24 hours after installation. No heavy traffic, rolling loads, or furniture placement are permitted for a minimum of 72 hours after installation.
- .2 Protect new floors from time of final set of adhesive until final inspection.
- .3 Install floor protection in areas where work, repairs and installation of equipment, and foot traffic will occur.

3.8 Maintenance

- .1 Perform initial maintenance and cleaning according to the manufacturer's written requirements.
- .2 Allow flooring to dry prior to applying protection.
- .3 Apply sealer and floor polish/finish coats in accordance with manufacturer's written maintenance recommendations for commercial use. Follow drying times between coats as indicated on product labels.

END OF SECTION

Fluid-Applied Flooring

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Fluid-applied flooring; FAF1, FAF2.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Advise other trades of fixtures and fittings not to be installed until floor coating materials are cured, such as: radiators, painting, decorating, floor-supported equipment or cabinetwork, caulking, plumbing, fixtures, and the like.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit shop drawings showing proposed divider strips and start / stop installation lines. Coordinate locations with slab control joints. Lay out divider strips symmetrically in rooms.
- .4 Samples:
 - .1 Submit 305 mm x 305 mm (12" x 12") samples of each specified material, in each specified colour to show successive applications of each coat for *Consultant's* approval.
 - .2 Submit 305 mm x 305 mm (12" x 12") sample of completed system on rigid backing, demonstrating texture and broadcast aggregate, colour, and sheen, for *Consultant's* approval.
- .5 Manufacturers' instructions:
 - .1 Submit substrate preparation guidelines, installation instructions, and general recommendations.
- .6 Submit for approval a list of the floor coating materials intended for use in the *Work* for each substrate condition before installation commences.
- .7 Include sample of warranty customized for this Project.
- .8 Submit list of recent projects completed by installation crew(s) proposed for work of this section available for viewing by *Consultant* and independent inspection and testing company.

Fluid-Applied Flooring

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
 - .2 Submit manufacturer's list of acceptable cleaning chemicals for each epoxy floor system specified in this section.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers:
 - .1 Company specializing in manufacturing the *Products* specified in this section, with 10 years' experience, minimum.
 - .2 Installers / applicators / erectors:
 - .1 Applicators: Shall have 5 years' experience, minimum, in application of *Products* and systems specified and with approval and training of *Product* manufacturers.
 - .2 Installation crews shall be highly skilled in the application of specified coatings with at least 10 years experience in the installation of coatings specified herein.
 - .3 *Subcontractor* must be approved by the flooring system manufacturer. Submit *Subcontractor's* certification letter prepared by the flooring system manufacturer.
 - .4 Execute work of this section only under full time supervision of qualified *Subcontractor's* site supervisor.
- .2 Mock-ups:
 - .1 Provide mock-up panel 3 m² (32.3 ft²) minimum area, of each system type at the *Place of the Work* as part of final installation for approval by *Consultant*, location to be determined by *Consultant*. Mock-up will serve as a benchmark for installation of the system for the *Work*.
 - .2 Each mocked-up area shall be tested to meet slip resistance requirements and results reviewed with *Owner*.
 - .3 Construct mock-up at the *Place of the Work* of cove base at door frames.

1.6 Field Conditions

- .1 Ambient conditions:

Fluid-Applied Flooring

- .1 Unless required otherwise by manufacturer's installation requirements maintain ambient temperature of not less than 13°C and below 32°C, and a floor temperature of not less than 16°C from 24 hours before installation to at least 72 hours after installation. Maintain relative humidity of not higher than 80% during same period.
- .2 Ensure that adequate ventilation is provided during installation and curing of materials of this section.

1.7 Delivery, Storage, and Handling

- .1 Deliver materials to the *Place of the Work* in sealed undamaged containers clearly labelled with name and batch number.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Material compatibility: Provide materials that are compatible with one another under conditions of service and application required, as demonstrated by manufacturer based on testing and field experience.
- .2 Slip resistance: Floors shall have a wet Dynamic Coefficient of Friction (DCOF) in accordance with ANSI A326.3, and to meet the following specified values:
 - .1 FAF-1: 0.42 or greater.
 - .2 FAF-2: 0.50 or greater.
- .3 Chemical resistance:
 - .1 Epoxy floor coatings shall be resistant to and compatible with the following list of chemicals:
 - .1 Hydrogen peroxide.
 - .2 Benzyl alcohol.
 - .3 Hydroxyacetic acid.
 - .4 Hydroxyethylidene diphosphonic acid.
 - .5 Dodecylbenzene sulfonic acid.
 - .6 Sulfuric acid.
 - .7 Alcohol, C9-C11, ethoxylated.
 - .2 Epoxy floor and wall system materials shall not deteriorate or discolour when exposed to the above specified chemicals.
- .4 Provide fluid-applied flooring with 150 mm base.
- .5 At rooms with a drain and at locations where a slope is indicated, provide an underlayment to achieve a slope to drain.

Fluid-Applied Flooring

- .6 Floors and wall coatings shall not show blistering, discolouration, colour change, shrinkage, cracking, or delamination.

2.2 General

- .1 Installation of systems specified in this section to be by a single *Subcontractor*.
- .2 Materials shall be sourced from one manufacturer unless otherwise specified.

2.3 Fluid-Applied Flooring; FAF1

- .1 Two component high solids, silicone-free, low-viscosity, self-priming and glossy epoxy resin.
 - .1 Waterproofing membrane: one – two coats.
 - .1 Acceptable *Product*:
 - .1 Sika 'Sikafloor 1610 Membrane'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Acceptable *Product*:
 - .1 Sika 'Sikafloor 261'.
 - .1 Topcoat: Sikafloor Duochem 942, gloss finish with 'Sikafloor 4 Texture'.
 - .2 Colour: RAL 7042 Traffic Grey.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.4 Fluid-Applied Flooring; FAF2

- .1 Decorative quartz aggregate epoxy flooring with cove base: Comprised with trowel-applied heavy-duty epoxy underlayment, broadcast and sealed epoxy floor, and coloured quartz aggregates finished with top coat.
 - .1 Thickness: 5 mm (3/16").
 - .2 Sheen: Gloss.
 - .3 Surface Texture: Slip resistant, for dry and wet conditions.
 - .4 Primer: Epoxy primer, manufacturer's standard.
 - .5 Screed mortar:
 - .1 Acceptable *Product*:
 - .1 Sika "Sikafloor 156 CA" with Sikafloor 'Aggregate PT'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .6 Waterproofing membrane: one – two coats.
 - .1 Acceptable *Product*:
 - .1 Sika 'Sikafloor 1610 Membrane'.

Fluid-Applied Flooring

- .2 Substitutions: in accordance with Section 01 25 00.
- .7 Base: Self levelling epoxy.
 - .1 Trowelled application.
- .8 Aggregate: Coloured quartz.
- .9 Seal coat: Manufacturer's standard epoxy, two coats, non-yellowing UV resistant.
 - .1 Glass-bead aggregate in addition to specified slip resistance.
- .10 Colour: Colour 100.
- .2 Acceptable *Products* and Manufacturers:
 - .1 Sika 'Sikafloor Quartzite HDB System'.
 - .1 Topcoat: Sikafloor Duochem 942, gloss finish.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.5 Transition Strips

- .1 Material: Aluminum.
- .2 Finish: Brushed chrome.
- .3 Acceptable *Product*:
 - .1 Schluter 'VINPRO-S'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.6 Mortar Underlayment

- .1 Design requirements: Concrete shall not be subject to hydrostatic pressure.
- .2 Polymer-modified cement based mortar bed and sloping mortar system:
 - .1 Polymer-modified hydraulic cement mortar bed and sloping mortar; rapid setting and rapid hardening with smooth finish.
 - .2 Comply with ANSI A108.1.
 - .3 Compressive strength: >3000 psi at 28 days, to ASTM C579-18 Method B (air cure only).
 - .4 Acceptable *Product*:
 - .1 Custom Building Products 'SpeedSlope'.
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Examination

- .1 Verify that specified field conditions are ensured before commencing the work of this section.

Fluid-Applied Flooring

- .2 Examine surfaces to receive floor and wall coatings. Surfaces shall be smooth, sound, dry, and free from conditions that will adversely affect execution, permanence, or quality of work.
- .3 Verify that surfaces to receive coatings can be put into acceptable condition by means of preparation specified in this section.
- .4 Floor surfaces to receive coating shall be equivalent to a light steel trowel finish for new or patched concrete surface.
- .5 Examine floor surfaces to be coated for slope to drain irregularities which could create non-sloping or ponding conditions on the epoxy coating surface.
- .6 Verify that floor drains are installed flush with top of floor slabs.
- .7 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.
- .8 Commencement of installation implies acceptance of surfaces as suitable to receive coating system.

3.2 Preparation

- .1 After acceptance of surfaces, prepare them as required to receive the work of this section. Remove projections and other conditions that may affect the installation of the flooring system.
- .2 Concrete slabs shall have sound surface free of dust, chemicals, grease, oil, laitance and curing agents.
- .3 Remove curing compounds, surface hardeners, existing flooring adhesives, and epoxy flooring coatings in accordance with manufacturer's written recommendations.
- .4 Fill open control joints, and other cracks and voids with sealant material compatible with floor coating materials.
- .5 Remove projections and other conditions which may affect installation of the coating.
- .6 Repair surface spalls and imperfections with patching compound approved by manufacturer.
- .7 Test surfaces for moisture content to verify that they are suitable for application, and fully cured. Check moisture content of concrete using a Delmhorst moisture meter. Moisture content shall be within the limits set by the coating manufacturer prior to commencing work.
- .8 Prepare concrete surfaces by mechanical method of steel shotblast, sandblast, or other method approved by coating manufacturer in accordance with International Concrete Repair Institute (ICRI) recommendations to achieve a CSP 3 profile. Thoroughly vacuum clean floors upon completion of blast operation. Substrate to be approved in writing by manufacturer prior to application of coating.
 - .1 Submit written report to *Consultant* following procedures for manufacturer's field review in accordance with Section 01 45 00.

Fluid-Applied Flooring

- .9 Cover or mask surfaces adjacent to those receiving coating to protect work of others and property from damage and soil.

3.3 Installation

.1 General:

- .1 Apply coatings 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.
- .2 Match colours and textures of approved samples.
- .3 Make clean true junctions with no visible overlap between adjoining applications of coatings.
- .4 Install flooring to entire area indicated or scheduled, including coverplates occurring within finished floor areas. Maintain overall continuity of colour and pattern with pieces of flooring installed on cover plates. Tightly butt edges to perimeter of floor around cover plates and to cover plates. Do not install flooring to floor drains occurring within finished floor areas.
- .5 Place cloths and other disposable coating materials, that are a fire hazard, in closed metal containers and remove from building every night.
- .6 Verify that spark-proof electrical equipment is used in area where inflammable materials are being applied.
- .7 Erect barriers to prevent the entry and presence of personnel not performing work of this section during application of coatings, and for 48 hours following completion of application.
- .8 Apply coating system in compliance with coating manufacturer's directions to produce a pinhole free surface that also provides a positive slope to drains in flooring system.
- .9 Apply coatings in continuous manner, starting and stopping in straight lines centre at doorways or other building lines; haphazard installation continuation lines will not be permitted.

.2 Application; flooring system:

- .1 Terminate flooring in straight lines at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .2 Trowelled or broadcast installation shall not show telegraphing of substrate or trowel or toolmarks.
- .3 Trowelled or broadcast installation shall be homogenous free of substrate lines, pockets, bumps and unevenness greater than 1.5 mm (1/16") in 300 mm (12"), not including texture.
- .4 Prime coat: mix components and apply primer over prepared substrate at manufacturer's recommended spreading rate, with timing of application coordinated with subsequent application of topping mix to ensure optimum adhesion between flooring materials and substrate.

Fluid-Applied Flooring

- .5 Body coat: mix components and trowel apply body coats over tacky primer at spreading rates as recommended by manufacturer. Broadcast aggregate into wet body coat. Build up flooring system as required to provide positive slope to drains.
- .6 Clean surface prior to application of finish coat for approval by *Consultant*.
- .7 Finish coats: Squeegee apply finish coats over tacky primer at spreading rates as recommended by manufacturer.
- .8 Provide zinc termination strips, of appropriate thickness, at cove base and where flooring system meets different flooring types.
- .9 Install beads at top of bases, and apply coating to wall with cove formed at junction with floor.
- .10 Apply cove base to a height of 150 mm (6") on vertical surfaces unless shown otherwise. Apply a continuous and even radius at floor transition. Apply base screed at termination of base. Fill gaps between base screed and wall with underlayment material.
- .3 Use saw cut and chip method at termination locations unless otherwise indicated.
- .4 Joints: Where substrate is interrupted by expansion or control joints, provide joint in coating system to comply with details indicated, or if not indicated, as recommended by coating system manufacturer. Fill joints with specified compounds.
- .5 Match approved samples in sheen, colour and texture.

3.4 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and as follows:
 - .1 Field tests and inspections:
 - .1 Moisture and alkalinity:
 - .1 Test for moisture vapour transmission in accordance with ASTM F1869-22 in accordance with manufacturer's written installation requirements. Maximum percentage of moisture acceptable is 1.8 kg/93 m² (4 lb/1000 ft²) in a 24 hour period, unless otherwise specified by manufacturer's printed literature.
 - .2 Test for surface pH. Levels of pH shall not exceed the written recommendations of the flooring manufacturer and adhesive manufacturer. Test in accordance with ASTM F710-22.
 - .3 For each test type: Perform 3 tests for flooring applications less than 186 m² (2000 square feet) in area, and 1 test per additional 93 m² (1000 square feet).
 - .4 Testing shall be by independent inspection and testing company and in accordance with Section 01 45 00.
 - .2 Coating thickness:

Fluid-Applied Flooring

- .1 Verify to Tooke thickness gauge, and in the presence of *Consultant* and manufacturer's representative, that thicknesses of completed coatings meet specified requirements.
- .2 Perform cut through/coring tests where selected by *Consultant* 1 per 93 m² (1000 ft²) in finished areas to determine thicknesses and finishes of epoxy coatings.
- .3 *Contractor* shall repair areas as a result of inspection and testing work.
- .3 Manufacturer's field review to be in accordance with Section 01 45 00.

3.5 Adjusting and Cleaning

- .1 Touch up and refinish minor defective work. Refinish entire coated surface areas where finish is damaged or otherwise unacceptable.
- .2 Remove promptly as work progresses spilled or spattered coating materials from surfaces of work performed under other sections. Clean surfaces on completion of work. Do not mar surfaces while removing.
- .3 Leave storage and mixing areas in same condition as equivalent spaces in project. Clean flooring just prior to final acceptance using materials and procedures recommended by flooring manufacturer.
- .4 Final cleaning is specified in section 01 77 00.

END OF SECTION

Raised Flooring

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Raised flooring system and understructure.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data and installation instructions for each component and system to be used, including other data as may be required to show compliance with the *Contract Documents*.
 - .2 Submit raised floor manufacture approved sealer data sheet.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings.
 - .2 Submit shop drawings showing system components, layout and configuration, locations of each type of raised flooring, construction and installation details, dimensions, materials and thicknesses, finishes, fasteners, typical and special edge conditions, accessories, and understructures.
 - .3 Clearly indicate design, fabrication details and loads transmitted to structure.
 - .4 Cooperate with mechanical and electrical trades in whatever way required in the preparation of interference drawings.
- .4 Certificates:
 - .1 Manufacturer's representative shall inspect surfaces and substrate preparations prior to material installation and submit written confirmation that substrates have been prepared in a manner which will not affect *Product* performance or warranty.
 - .2 Raised floor system manufacturer shall submit certificate of acceptance that installation meets their requirements.
 - .3 Submit letter of certification and related testing reports to confirm that the raised floor assembly is electrically continuous and forms an "effective equipotential" plane per the building code.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:

Raised Flooring

- .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Manufacturers:
 - .1 Company specializing in manufacturing *Products* specified in this section, with 10 years' experience, minimum.
 - .2 Manufacturer shall have maintained for 5 years minimum prior to date of *Contract*, local manufacturing facilities, complete with installation crews and service representatives, or shall have contractual affiliation with authorized dealer outlet having previously stipulated qualifications.
 - .2 Installers / applicators / erectors:
 - .1 Applicators: Shall have 5 years' experience, minimum, in application of *Products* and systems specified and with approval and training of *Product* manufacturers.
 - .2 *Subcontractor* must be approved by the flooring system manufacturer. Submit *Subcontractor's* certification letter prepared by the flooring system manufacturer.
 - .3 Execute work of this section only under full time supervision of qualified *Subcontractor's* site supervisor.
- .2 Mock-ups:
 - .1 Construct mock-up panel, 3 m² (32 ft²) minimum area, of raised flooring system, as part of final installation for review and approval by *Consultant*, location to be determined by *Consultant*.

1.6 Delivery, Storage, and Handling

- .1 Deliver and store material in factory-crated containers with seals and labels intact. Pack material in a manner to prevent damage to and contamination of finished surfaces.

1.7 Field Conditions

- .1 Do not install raised flooring system until building is enclosed and has an ambient temperature of between 10°C and 29°C and will be so maintained during and after installation. Relative humidity shall be not less than 20% and not more than 80%.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Design and certify raised floor system to be in compliance with requirements of authorities having jurisdiction, including seismic loading conditions.
 - .1 Seismic performance: Provide raised flooring system capable of withstanding the effects of seismic motions determined according to building code.

Raised Flooring

- .2 Pedestals shall be structurally adhered to concrete subfloor, unless otherwise indicated.
- .3 Entire system shall be electrically continuous to allow for grounding by Divisions 26, 27, and 28.
- .4 Parts shall be easily removed and replaced or dismantled, rearranged, interchanged and easily removed for cable outlets, and other services.
- .5 Completed floor system shall be sturdy, rigid, firm and free of vibration, rocking panels, rattles, squeaks and other noises.
- .6 *Provide* metal bridging supports for raised flooring when required to bridge mechanical work.
- .7 Raised flooring shall exhibit none of the following once placed into service:
 - .1 Delamination or other separation of applied traffic surface or edge finishing materials.
 - .2 Delamination, chipping or cracking of panels.
 - .3 Formation of corrosion.
 - .4 Pitting and disintegration of metals due to electrolysis (galvanic action) resulting from contact between incompatible materials.
 - .5 Failures in connections and structural stability and soundness causing collapse, vibration, rattle, squeaks, rocking panels.
 - .6 Failure of installation to maintain its elevation or remain level within the specified installation tolerances.
 - .7 Failures in case of removal, dismantling or interchangeability of components.
 - .8 Static development.

2.2 Raised Floor Systems

- .1 Cementitious floor panels, 1134 kg (2500 lb) concentrated load, stringerless:
 - .1 Cementitious filled metal pan system with posilock corner screw understructure.
 - .1 Acceptable *Product*:
 - .1 Global IFS 'TecCrete 1500SL'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 Floor panel size: 610 mm x 610 mm (24" x 24").
 - .3 Structural performance: in accordance with CISCA Recommended Test Procedures for Raised Floors.
 - .4 Safety factor: Panel supported on actual the system shall be capable of withstanding a minimum of 2 times the design load anywhere on the panel without failure. Failure is defined as the point at which the system will no longer accept the load.

Raised Flooring

- .5 Concentrated static load: 680 kg (1500 lb). on 25 mm (1") square (one square inch) at any location with a top surface deflection not to exceed 2.5 mm (0.10"), and a permanent set not to exceed 2.5 mm (0.10").
- .6 Uniform load: 318 kg (700 lb) per 305 mm (12") square (square foot) with a maximum top surface deflection not to exceed 1 mm (0.040"), and a permanent set not to exceed 0.25 mm (0.010").
- .7 Rolling load: Panels shall withstand a rolling load of 680 kg (1500 lb) applied through a 76 mm (3") diameter x 46 mm (1-13/16") wide caster for 10 cycles over the same path with a maximum of 1.0 mm (0.040") top surface permanent set. Panels shall withstand a rolling load of 567 kg (1250 lb). applied through a hard rubber-surfaced wheel 152 mm (6") diameter x 50 mm (2") wide for 10,000 cycles over the same path with a maximum of 1 mm (0.040") top surface permanent set.
- .8 Impact load: 68 kg (150 lb) load dropped from 914 mm (36") onto 25.4 mm (1") indenter shall not cause a system failure.
- .9 Flammability: panel shall meet the following criteria when tested in accordance with CAN/ULC S102.2-10: Flame spread of 25; Smoke developed of less than 50.
- .10 Raised floor shall be non-combustible to CAN/ULC S135-04.

2.3 Pedestal Assembly

- .1 Pedestal assemblies shall be corrosive resistant, all steel welded construction.
- .2 Pedestal assemblies shall provide a means of levelling and locking the assembly at a selected height, which requires deliberate action to change height setting and prevents vibration displacement. Adjustment range shall be +/- 25.4 mm (1") for finished floor heights 150 mm (6") or greater to suit required height as indicated on drawings for specified locations.
- .3 Pedestal support assembly shall provide an average overturning moment of 11.5 kg-m (1000 in-lb) when glued to a clean, sound, uncoated concrete surface. Structural tests or calculations shall be required attesting to the lateral stability of the system under seismic conditions. Pedestal shall support a minimum of 2721.5 kg (6000 lb) axial load without permanent deformation.
- .4 Pedestal head shall be designed with locating tabs and integral shape to interface with the panel for positive lateral retention and positioning without fasteners. Pedestal head shall be fabricated with integral sound deadening gasket.
- .5 Hot dip galvanized steel pedestal head shall be welded to a threaded rod which includes specially designed adjusting nut. Adjusting nut shall provide location lugs to engage the pedestal base assembly, such that deliberate action is required to change the height setting.
- .6 Threaded rod shall provide a specially designed anti-rotation device, such that when the head assembly is engaged in the base assembly, the head cannot freely rotate.
- .7 Hot dip galvanized pedestal base assembly shall consist of a formed steel plate with no less than 103 mm² (16 square inches) of bearing area, welded to a 7/8" square steel tube and shall be designed to engage the head assembly.

Raised Flooring

- .8 Pedestal adhesive: Rubber base, non-soluble, non off-gassing adhesive recommended by raised floor manufacturer, and compatible with concrete floor sealer.
- .9 Perimeter support: *Provide* panel edge support and construct edges to achieve smooth transition between top of raised floor and adjacent dissimilar flooring.

2.4 Manufacturing Tolerances

- .1 Nominal panel size ± 0.4 mm (0.015") or less.
- .2 Panel flatness ± 0.5 mm (0.020") or less, measured along edge.
- .3 Panel squareness ± 0.4 mm (0.015") or less.
- .4 Panel interchange-ability: Panels, except those modified to meet special conditions, shall be interchangeable.

2.5 Floor Panel Coverings

- .1 Provide bare panels without factory-applied floor coverings on traffic surfaces unless otherwise scheduled or indicated.
- .2 Resilient flooring: locations as indicated, in accordance with Section 09 65 15.

2.6 Accessories

- .1 Where options are given in the *Contract Documents* for the use of combinations of dissimilar metallic components, provide acceptable, permanent dielectric separators for such metals.
- .2 Perimeter support: *Provide* manufacturer's standard method for supporting panel edge and forming transition between raised flooring and adjoining floor coverings at same level as raised flooring.

2.7 Electrical Resistance of Floor

- .1 Raised floor understructure to be grounded by Divisions 26, 27, and 28.
- .2 If tests indicate that the resistances are not as specified, *Subcontractor* shall supply materials and labour as necessary to ensure compliance with this section.

PART 3 - EXECUTION

3.1 Examination

- .1 Prior to commencing work of this section, examine substrate for suitability of receiving pedestals, and report in writing unsatisfactory surfaces and conditions detrimental to proper installation of work under this section.
- .2 Commencement of installation shall be construed as acceptance of existing surfaces and conditions and no after-claims based on these surfaces and conditions will be entertained.

3.2 Installation

- .1 Vacuum clean subfloor and thoroughly remove dirt, dust, extraneous materials, foreign matter, and deleterious materials under raised flooring areas.

Raised Flooring

- .2 Apply 2 coats of concrete sealer to concrete floor slabs under raised flooring system areas and allow to dry.
- .3 Secure pedestals to sealed concrete slab with an raised flooring manufacturer recommended adhesive, compatible with concrete sealer.
- .4 Install raised flooring system in accordance with system manufacturer's written requirements.
- .5 Prohibit traffic, on raised floor areas for minimum 24 hours after pedestal installation to allow pedestal adhesive to set. Do not allow removal of raised floor panels by work of other sections for 72 hours after panel installation.
- .6 Clean dust, dirt, and construction debris caused by floor installation, including vacuuming subfloor area, as installation of floor panels proceeds.
- .7 Partially completed floor installations shall be braced against shifting to maintain the integrity of the installed system.
- .8 *Provide* additional pedestals as needed to support panels where floor is disrupted by columns, walls, and perimeter cutouts.
- .9 *Provide* steel support framing as required at locations where mechanical and or electrical equipment and services require the elimination of a pedestal.
- .10 *Provide* continuously supported steel filler strips at raised floor gaps less than minimum cut panel width.
- .11 Understructure shall be aligned such that uncut panels are interchangeable and fit snugly but do not bind when placed in alternate positions.
- .12 Plywood: 2 staggered fire retardant plywood in accordance with Section 06 10 53.
- .13 Level installed raised flooring to specified installation tolerances.
- .14 Minimum cut panel width: 100 mm (4"). Avoid using panels cut to less than 150 mm (6").
- .15 Fit tight and continuously support panels around columns and slab edges.
- .16 Make minor adjustments to pedestal locations to suit given variables and unforeseen conditions arising after shop drawing review, and only after specifically reviewing such conditions with *Consultant*.
- .17 *Provide* low clearance pedestals at interior and perimeter concrete curbs as required.
- .18 At junction of stringer pedestal system with stringerless system provide pedestal design to accommodate transition.
- .19 Allow for structural expansion where indicated on drawings and provide extruded aluminum expansion joint covers in accordance with manufacturer's recommended details.

3.3 Installation - Tolerances

- .1 Raised flooring system shall be installed level within ± 2 mm (0.060") in 3 m (10'-0") and ± 3 mm (0.100") for the entire floor.

Raised Flooring

3.4 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.5 Adjusting and Cleaning

- .1 Upon completion of installation, clean exposed surfaces and areas below raised floor of dirt, dust, and debris and dispose.
- .2 Inspect finished installation and make good and replace damaged and faulty workmanship, materials and finishes as directed at no cost to *Owner*.
- .3 Comply with Section 01 77 00 for final cleaning requirements.
- .4 *Provide* protection for finished surfaces after installation to prevent damage, marring, contamination and soiling due to construction activities consisting of heavy-duty kraft paper covering, held in place by means of non-staining, non-marking, pressure sensitive adhesive tapes.

END OF SECTION

Interior Wall Paneling

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Interior wall paneling; WP1, WP2, WP3, WP4, WP5.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Coordination of work: coordinate layout, penetrations and installation of work of this section with work of other sections.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data:
 - .1 Submit *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Submit shop drawings to show layout, treatment at walls, and other objects. Indicated details of proposed treatment where materials meet other materials.
- .4 Samples:
 - .1 Submit 305 mm x 305 mm (12"x 12") sample of wall panel showing each finish and colour.
 - .2 Submit samples of each accessory type product specified.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
 - .2 Submit panel manufacturer's maintenance and cleaning video for each type of wall paneling system.

1.5 Quality Assurance

- .1 Qualifications:
 - .1 Installers / applicators / erectors:

Interior Wall Paneling

- .1 Provide work of this section, executed by competent installers with minimum 5 years experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Fabricator solid surfacing: Fabrication to be performed by a solid surface manufacturer's certified fabricator.
- .2 Mock-ups:
 - .1 Provide full size system mock-up of each wall panel system type, for review and acceptance by *Consultant*. Locate at the *Place of the Work* where directed by the *Consultant*.

PART 2 - PRODUCTS

2.1 Design Requirements

- .1 Where WP is indicated with a 'H' on drawings indicates partial height of 1200 mm AFF. Locations where scheduled or indicated.
- .2 Colour match sealants at vertical joints unless otherwise indicated.

2.2 Interior Wall Panel Systems

- .1 WP1; Wall Protection Type 1:
 - .1 Semi rigid sheet wall protection in PVC or PETG with trims. Minimum thickness of 1.5mm (0.060").
 - .1 Performance/design requirements:
 - .1 Resistant to certain bacterial and fungal growth in accordance with ASTM G21 and G22.
 - .2 Chemical and stain resistance in accordance with ASTM D1308.
 - .3 Panel to panel colour match: Delta Ecmc of no greater than 1.0 using CIELAB color space.
 - .4 Impact strength: tested for impact using a ram-type impact test in accordance with ASTM F476.
 - .5 Flammability: CAN/ULC S102.2-10, FSV <25.
 - .2 Height: full height, except where indicated or scheduled.
 - .3 Finish: Suede Texture.
 - .4 Colour:
 - .1 WP1a: to match Acrovyn White #949.
 - .5 Acceptable *Products*:
 - .1 Construction Specialties 'Acrovyn'.
 - .2 IPC 'Palladium'.
 - .3 Substitutions: in accordance with Section 01 25 00.

Interior Wall Paneling

- .2 Joint sealant: Panel manufacturer's sealant, colour clear or to match to panels to later selection by *Consultant*. Butt joint seams and seal with colour matched sealant.
- .3 Panel fixing method: Panel manufacturer's adhesive. Colour to match panel.
- .4 Preformed corner trim to match adjacent panel.
- .2 WP2; Wall Protection Type 2:
 - .1 Solid surfacing sheet:
 - .1 Homogenous (not coated, acrylic laminated or composite construction), filled material containing methyl methacrylate.
 - .2 Flammability: CAN/ULC S102.2-10, FSV <25.
 - .3 Nominal sheet thickness: 6 mm (1/4") minimum.
 - .4 Height: full height, except where indicated or scheduled.
 - .5 Colours:
 - .1 WP2a: to match Corian 'Glacier White'.
 - .2 WP2b: to match Corian 'Cameo White' (Field).
 - .3 WP2c: to match Corian 'Elegant Grey' (Accent).
 - .6 Acceptable *Products*:
 - .1 Dupont 'Corian'.
 - .2 Aristech 'Avonite'
 - .3 Substitutions: in accordance with Section 01 25 00.
 - .2 Seams to be glued with joint adhesive by panel manufacturer.
 - .3 Panel fixing method: As recommended by panel manufacturer.
- .3 WP3; Wall Protection Type 3:
 - .1 Thickness: minimum 2.5 mm.
 - .2 Height: full height, where indicated:
 - .3 WP3a, WP3c, WP3f, WP3g:
 - .1 Acceptable *Product*:
 - .1 Altro 'Whiterock Wall Designs'.
 - .2 Description: Extruded semi-rigid virgin PVCu sheet.
 - .1 Impact resistance: ASTM D5420-16, exceeds 198 inch lbs.
 - .2 UV exposure: tested to ASTM G154-16.
 - .3 Flame spread:
 - .1 Maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame Spread Value (FSV): 10.

Interior Wall Paneling

- .2 Smoke Developed Value (SDV): 260.
- .4 Surface finish: Satin.
- .5 Colours:
 - .1 WP3a: Warm Woodgrain 9904.
 - .2 WP3c: Summer Weave 9908.
 - .3 WP3f: Autumn Weave 9910.
 - .4 WP3g: White Mineral 9905.
- .6 Accessories:
 - .1 Joint strips: to later selection by *Consultant*.
 - .2 Transition strips: to later selection by *Consultant*.
 - .3 Start and edge strip: to later selection by *Consultant*.
- .4 WP3b, WP3e, WP3k:
 - .1 Acceptable *Product*.
 - .1 Altro 'Whiterock Matte'.
 - .2 Description: Extruded semi-rigid virgin PVCu sheet.
 - .1 Impact resistance: ASTM D5420-16, exceeds 160 inch lbs.
 - .2 Fungi resistance: zero, to ASTM G21-15.
 - .3 Mold resistance: 10, to ASTM D3273-16.
 - .4 Antimicrobial: HACCP certified.
 - .5 UV exposure: tested to ASTM G154-16.
 - .3 Flame spread:
 - .1 Maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame Spread Value (FSV): 10.
 - .2 Smoke Developed Value (SDV): 300.
 - .4 Surface finish: Lightly textured.
 - .5 WP3b: 'H' denoted partial height at 1220 mm AFF.
 - .6 Colours:
 - .1 WP3b: Pearl FT/41.
 - .2 WP3e: Almond FT/32.
 - .3 WP3k: Colour to later selection by *Consultant*.
 - .7 Accessories:
 - .1 Joint strips: 2-Part Joint Strip.
 - .2 Transition strips: 1-Part Transition Strip.

Interior Wall Paneling

- .3 Start and edge strip: 2-Part Start and Edge Strip.
- .4 Double sided tape: type as recommended by product manufacturer.
- .5 WP3d:
 - .1 Acceptable *Product*.
 - .1 Altro Whiterock PopArt Matte.
 - .2 Description: Extruded semi-rigid PVC sheet with graphic printed directly to sheet, complete with matte finish protective coating.
 - .3 Custom image to later selection by *Consultant*.
- .6 Panel fixing method: As recommended by panel manufacturer.
- .7 Accessories:
 - .1 Prefabricated corners.
 - .2 Welding rod: as recommended by panel manufacturer.
 - .3 Sealant: type as recommended by panel manufacturer.
 - .4 Panel cleaning materials: as recommended by panel manufacturer.
- .4 WP4; Wall Protection Type 4:
 - .1 FRL:
 - .1 Thickness: 1.9 mm (0.075").
 - .2 Flame spread:
 - .1 Maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame Spread Value (FSV): 5.
 - .2 Smoke Developed Value (SDV): 70.
 - .3 Acceptable *Product*.
 - .1 Panolam Surface Systems 'FRL Wall Protection Panels.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 WP4a; full height:
 - .1 Brand: Panolam/Pionite.
 - .2 Colour: White Elm FW591.
 - .3 Finish: Textured/Suede.
 - .3 WP4b:
 - .1 Height: full height, except where indicated or scheduled.
 - .2 Brand: Panolam/Pionite.
 - .3 Colour: Winter White FS573.
 - .4 Finish: Textured/Suede.

Interior Wall Paneling

- .2 WP4c:
 - .1 Brand: Panolam.
 - .2 Colour to later selection by *Consultant* to coordinate with adjacent wall graphic.
 - .3 Finish: Textured/Suede.
- .4 WP4d-1/WP4d-2/WP4d-3: full height.
 - .1 Brand: Panolam.
 - .2 Custom digitally printed FRL. Graphic images to later selection by *Consultant*.
 - .3 Sealant: clear or colour matched sealant at vertical joints to later selection by *Consultant*.
- .5 WP4f:
 - .1 Brand: Panolam/Pionite.
 - .2 Colour: Navy Blue FS740.
 - .3 Finish: Textured/Suede.
- .6 Trims:
 - .1 Manufacturer's standard moulding profiles, except as follows:
 - .1 Where WP4d-1 wraps around a wall corner, provide Schluter Jolly edge trim at vertical edge.
- .7 Adhesive: type as recommended by panel manufacturer.
- .8 Sealant; pick-proof, in accordance with Section 07 92 00.
- .5 WP5; Wall Protection Type 5:
 - .1 Description: Rigid and antibacterial PVC wall system with solid colour and textured surface.
 - .2 Thickness 2 mm.
 - .3 Height: Full height unless otherwise indicated or scheduled.
 - .4 Finish: Matte.
 - .5 Colours:
 - .1 WP5a: Sage 0044.
 - .2 WP5b: Chalk 0001.
 - .3 WP5c: Glacier 0016.
 - .6 Flammability: CAN/ULC S102.2-10, FSV <25.
 - .7 Acceptable *Product*:
 - .1 GerFloor 'SPM Wall Protection Decochoc'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .8 Panel fixing method: As recommended by panel manufacturer.

Interior Wall Paneling

- .9 Accessories:
 - .1 Adhesive: type as recommended by panel manufacturer.
 - .2 Welding rod: as recommended by panel manufacturer.
 - .3 Sealant: type as recommended by panel manufacturer.

PART 3- EXECUTION

3.1 Installation

- .1 Maintain top to bottom grain direction, uniformly.
- .2 Ensure adequate adhesive transfer by thoroughly rolling entire panel surface using a wall roller.
- .3 Allow 1.6 mm (1/16") gap at panel joints, ceiling, door and window frames, pipes, baseboards, and projections to accommodate panel expansion. Seal joints and gaps full with colour matched sealant, and tool concave to match accepted mockup.
- .4 Seal transition trim between panels with silicone sealant. Allow required gap between top of flash-coved flooring and panels to accommodate expansion.
- .5 Seal transition strip to flash-coved sheet flooring with matching sealant. Allow required gap between top of flash-coved flooring and panels to accommodate expansion.
- .6 Check substrates for adhesion. Maintain at least 100% coverage of direct transfer of adhesive between panels and panel substrate.

3.2 Installation Tolerances

- .1 Panel joints within 1.6 mm (1/16") of plumb and at terminations within maximum joint variation of 1.6 mm (1/16")

3.3 Field Quality Control

- .1 Manufacturer's field review: in accordance with Section 01 45 00.

END OF SECTION

Painting

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Painting of exterior paintable surfaces.
 - .2 Painting of interior paintable surfaces.
- .2 Paintable and non-paintable surfaces:
 - .1 Paint and finish paintable surfaces included in the *Work*, except where excluded by the *Contract Documents*.
 - .2 The following surfaces are considered non-paintable, except as otherwise indicated or scheduled:
 - .1 Material and equipment furnished prime and finish painted.
 - .2 Internal surfaces of steel tanks and stacks.
 - .3 Sprayed fire-resistive materials.
 - .4 Exterior concrete.
 - .5 Stainless steel, weathering steel, copper, bronze, chromium plate, nickel, anodized or lacquered or mill finished aluminum, Monel metal.
 - .6 Exterior galvanized surfaces.
 - .7 Insulation, glass, plastic, brick, stone.
 - .8 Metallic and mastic insulation finishes.
 - .9 Abrasive material finishes on floors, stair treads, stair nosing and landings.
 - .10 Insulated electric cables.
 - .11 Machined parts of machinery and equipment.
 - .12 Concealed surfaces.
 - .13 Manufactured finish materials.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets and list of *Products* proposed for use in the work of this section as identified in 'Approved Product List' section of the MPI (Master Painters Institute) Architectural Painting Specification Manual. Correlate *Products* to Schedule furnished by *Consultant*.

Painting

.3 Samples:

.1 Samples for initial paint colour and finish selection:

- .1 Submit manufacturer's colour charts showing full range of colours available, including light and deep dark tones, for each type of finish material indicated for colour selection by *Consultant*.
- .2 *Consultant* shall have complete freedom in choice of colours in compiling colour schedule and will not necessarily select colours from standard colour charts of manufacturer of *Products* specified.
- .3 Submit 3 drawdowns of each selected colour for review by *Consultant* and resubmit to *Consultant* as required to obtain approval. Drawdown to be of specified colour, sheen, and paint formula for applicable surface.

.2 Samples for verification:

- .1 Submit 3 samples on 200 mm x 305 mm (8"x 12") material of same type as that on which coating is to be applied, for *Consultant's* approval, at least 30 days before materials are required.
- .2 Identify each sample as to *Project*, finish, formula, colour name, number, gloss name and number, date and name of *Contractor* and painting *Subcontractor*.
- .3 Resubmit as required until colours and gloss value are approved.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.
- .3 Maintenance materials:
 - .1 Provide 2 sealed containers, each of 4 litres (1 gallon) capacity of each paint product in each colour used in the *Work* for *Owner's* maintenance use. Containers shall be new, clearly labelled with manufacturer's name, type of paint, colour and colour number. Store at *Place of the Work* where directed by *Owner*.

1.5 Quality Assurance

- .1 Qualifications
 - .1 Manufacturers:
 - .1 Paint manufacturers and *Products* used shall be as listed under the Approved Product List section of the MPI Painting Manual.
 - .2 Installers / applicators / erectors:
 - .1 Applicators: Shall have minimum 5 years proven satisfactory painting experience of projects of similar size and class subject to *Consultant's* approval.

Painting

- .2 Only qualified journeymen who have a “Tradesman Qualification Certificate of Proficiency” shall be engaged in painting work. Apprentices shall work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .2 Mock-ups:
 - .1 Provide mock-ups of each paint system for indicated surfaces of each colour and finish selected to verify preliminary paint selections made under Sample submittals.
 - .2 Mock-ups shall be located to areas as directed by *Consultant* under lighting conditions matching final area lighting, for acceptance by *Consultant*.
 - .3 Mock-ups shall demonstrate aesthetic effects of paint colour and sheen and shall set quality standards for material and execution of the *Work*. Final approval of colour and finish selections shall be based on mock-ups. If colour selections are not approved, apply additional mock-ups of additional colours selected by *Consultant* at no added cost to the *Owner*.
 - .4 Do not proceed with work, including ordering of paint *Products*, until mock-ups of each paint colour and finish and paint system for indicated surfaces have been reviewed and accepted by *Consultant*.
 - .5 Upon completion and approval, mock-ups shall serve as a standard for the balance of the work of this section. Subsequent work carried out and not in the *Consultant's* opinion equal to standard shall be repainted without charge.

1.6 Delivery, Storage, and Handling

- .1 Deliver painting materials in sealed, original labelled containers bearing manufacturer's name, brand name, type of paint or coating and colour designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.
- .2 Store paint *Products* and materials in original labelled containers in secure (lockable), dry, heated and well ventilated single designated area meeting minimum requirements of both paint manufacturer and authorities having jurisdiction, and at a minimum ambient temperature of 7°C.
- .3 Protect floor and wall surfaces of storage area. Protect floors with sheets or clean plywood or metal pans where mixing is being carried out.

1.7 Field Conditions

- .1 Ambient conditions:
 - .1 Comply with environmental requirements of MPI Manual.
 - .2 Perform no painting work when ambient air and substrate temperatures are below 10°C for both interior and exterior work, unless suitable weatherproof covering and sufficient heating and ventilation facilities are in place in accordance with MPI Manual.
 - .3 Perform no painting work when relative humidity is above 85% or when dew point is less than 3°C (5°F) variance between air/surface temperature.

Painting

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Except where more stringent requirements are specified, the following reference standard shall govern the work of this section:
 - .1 Master Painters Institute (MPI) Architectural Painting Specification Manual (MPI Manual), including Identifiers, Evaluation, Systems, Preparation and Approved Product List, latest edition, and referenced herein as the MPI Manual, as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.
- .2 Materials, preparation and workmanship shall conform to requirements of latest edition of Architectural Painting Specification Manual by the Master Painters Institute (MPI) (hereafter referred to as the MPI Painting Manual) as issued by the local MPI Accredited Quality Assurance Association having jurisdiction.
- .3 Painting systems:
 - .1 Shall remain free from failure due to causes including: material failure; surface preparation less than that specified; and paint film thickness less than that specified, or when not specified, less than that coverage recommended by manufacturer.
 - .2 Presence of any of following shall constitute failure: visible corrosion; film peeling, blistering, checking, scaling, embrittling or general film disintegration; and poor adhesion as determined by tape "peel-off" test procedures.

2.2 Materials

- .1 *Products* listed in MPI Manual shall be used in the *Work*, unless specified otherwise.
- .2 Paint and materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, and the like) shall be in accordance with the MPI Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .3 Other paint materials, such as linseed oil, shellac, and the like, shall be highest quality *Products* of an approved manufacturer listed in the MPI Manual and shall be compatible with other coating materials as required.
- .4 Paint materials shall have good flowing and brushing properties and shall dry or cure free of blemishes or sags.
- .5 Where required, paints and coatings shall meet flame spread and smoke developed ratings designated by building code requirements and/or authorities having jurisdiction.
- .6 Paints and coatings materials used within the weatherproofing system shall not exceed the VOC content limits of the following criteria.
 - .1 Interior paints and coatings: to following Green Seal GS-11 VOC limits:
 - .1 Flat coating type: 50 gm/L.
 - .2 Non-flat coating type: 150 gm/L.
 - .2 Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Green Seal Standard GC-03, Anti-Corrosive Paints, maximum 250 gm/L.

Painting

- .3 Clear wood finishes, floor coatings, stains, and shellacs applied to interior elements: South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings.

2.3 Equipment

- .1 Painting and coating equipment in accordance with written requirements of MPI Manual.

2.4 Mixing and Tinting

- .1 Unless otherwise specified, paints shall be ready-mixed. Re-mix prior to application to ensure colour and gloss uniformity.
- .2 Paste, powder or catalysed paint mixes shall be mixed in accordance with manufacturer's written requirements.
- .3 Perform colour tinting operations prior to delivery of paint to *Place of the Work*.
- .4 Where thinner is used, addition shall not exceed paint manufacturer's recommendations.

2.5 Colours and Gloss Levels

- .1 Paint colours and gloss levels shall be as selected by the *Consultant*. Locations as indicated or scheduled.
- .2 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI values:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat finish	0 to 5	10 maximum
G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	35 minimum
G5	Semi-gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
G7	High-Gloss finish	> 85	

PART 3 - EXECUTION

3.1 Examination

- .1 Prior to commencement of work of this section, thoroughly examine surfaces scheduled to be painted.
- .2 Check moisture content and alkalinity of surfaces to be painted in accordance with paragraph above titled Field Conditions.
- .3 Inspect surfaces to be coated for gouges, marks, nibs, and other defects and properly prepare patching, filling, smoothing or other surface preparation necessary to ensure satisfactory finish.
- .4 Report in writing any condition adversely affecting work of this section.

Painting

- .5 Proceed with work only when surfaces and conditions are satisfactory. Remove dust, grease, rust, scale and extraneous matter, tool and machine marks and insects from surfaces which could be detrimental to a satisfactory and acceptable finish.

3.2 Preparation

- .1 Comply with manufacturer's written requirements and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- .2 Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - .1 After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- .3 Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, mildew, grease, and incompatible paints, encapsulants, and other deleterious materials.
- .4 Paint surfaces when moisture content or alkalinity of surfaces to be painted comply with paragraph 3.5 Field Quality Control / Standard of Acceptance.
- .5 Concrete substrates: Remove release agents, curing compounds, efflorescence, and chalk.
- .6 Masonry substrates: Remove efflorescence and chalk.
- .7 Shop-primed steel substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- .8 ZF75 and ZF120 galvanized-metal substrates: Remove grease and oil residue from galvanized sheet metal by methods to produce clean surfaces that promote adhesion of subsequently applied paints.
- .9 Z275 galvanized-metal substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- .10 Aluminum substrates: Remove loose surface oxidation.
- .11 Existing painted substrates:
 - .1 Clean substrates as indicated above.
 - .2 Sound existing paint surfaces and remove paint surfaces that are not sound, loose or are otherwise stained, cracked, wrinkled, peeling, or defective.
 - .3 Dull hard or glossy surfaces by sanding or other abrasive methods prior to finishing.
 - .4 Apply tie-coat primer product that compatible with substrate as recommended by paint coatings manufacturer.
 - .5 Follow with paint finish coats as specified for like substrate materials specified herein.

Painting

3.3 Installation

- .1 Do not paint unless substrates are acceptable and/or until Field Conditions (heating, ventilation, lighting and completion of work of other sections) are acceptable for applications of *Products*.
- .2 Apply primer, paint or stain in accordance with MPI Manual Premium Grade finish requirements.
- .3 Apply paint and coatings within an appropriate time frame after cleaning when Field Conditions encourage flash-rusting, rusting, contamination or manufacturer's paint specifications require earlier applications.
- .4 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.
- .5 Tint each coat of paint progressively lighter to enable confirmation of number of coats.
- .6 Unless otherwise approved by *Consultant*, apply a minimum of 4 coats of paint where deep or bright colours are used to achieve satisfactory results.
- .7 Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 1000 mm (39").
- .8 Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer's directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.
- .9 Prime coat of stain or varnish finishes may be reduced in accordance with manufacturer's directions.
- .10 Paint finish shall continue through behind wall-mounted items (i.e. chalk and tack boards) and exposed/ visible in complete work including interiors of cupboards and closets, tops of doors, trim, and the like, whether in sight line or not, including behind surface mounted fixtures and heating units.
- .11 *Consultant* shall have right to make changes in colour tone of finishes prior to final coat to obtain desired results without additional cost to *Owner*.
- .12 Access doors, prime coated butts and other prime painted hardware, registers, radiators and covers, exposed piping and electrical panels shall be painted to match adjacent surfaces in terms of colour, texture and sheen, unless otherwise indicated.

3.4 Mechanical and Electrical Items

- .1 Finish paint primed mechanical and electrical items with 2 coats of paint. Include for the following list unless otherwise indicated:
 - .1 Convectors.
 - .2 Condensers.
 - .3 Conduit.
 - .4 Diffusers.
 - .5 Ductwork.

Painting

- .6 Grilles.
- .7 Hangers.
- .8 Heaters.
- .9 Fire hose cabinets.
- .10 Fire extinguisher cabinets.
- .11 Louvres.
- .12 Radiators.
- .13 Stacks.
- .14 Vents.
- .2 Prime and paint exposed insulated and bare pipes. Prime and paint exposed conduits and electrical raceways, fittings, outlet boxes, junction boxes, pull boxes and similar items. Use heat resistant epoxy paint on pipes and surfaces where operating surface temperature exceeds 65°C.
- .3 Coordinate the painting of pipes, and coverings with mechanical contractor applying colour banding, flow arrows and pipe identification after the painting of pipes and coverings.
- .4 Paint work to match adjacent walls and ceilings unless directed otherwise.
- .5 Paint interior surfaces of air ducts and pipe trenches including heating pipes and elements that are visible through grilles and louvres with one coat of flat metal paint to limit of sight-line. Paint to be black or white as directed by *Consultant*.
- .6 Gas pipes, whether concealed or exposed, shall be painted in accordance with gas code.
- .7 Paint and finish wall surfaces behind convectors. Walls to be finished prior to installation of convector covers. Touch up walls after covers are installed as necessary to make good installation damage.
- .8 Air diffusers shall be primed and finished with 2 coats of paint of same colour and sheen as ducts and/or ceiling.

3.5 Field Quality Control / Standard of Acceptance

- .1 Conduct quality control in accordance with Section 01 45 00.
 - .1 Field tests and inspections:
 - .1 Paint and Coating Quality Assurance Inspections:
 - .1 Field quality control shall be in accordance with Section 01 45 00.
 - .2 Moisture and alkalinity testing:
 - .1 Check moisture content of surfaces to be painted using properly calibrated electronic moisture meter approved by paint manufacturer, and *Consultant*, or other approved method. Maximum moisture contents shall be in accordance with manufacturer's recommendations and as follows:
 - .1 Concrete and concrete masonry (clay and concrete brick/block):
Maximum 12%.

Painting

- .2 Gypsum board and plaster: Maximum 12%.
- .3 Wood: Maximum 15%.
- .2 Conduct moisture tests on concrete floors using cover patch test method.
- .3 Test concrete, masonry and plaster surfaces for alkalinity.
- .3 Painted exterior and interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the *Consultant*:
 - .1 Brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 - .3 Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .4 Damage due to application on moist surfaces or caused by inadequate protection from weather.
 - .5 Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).
- .4 Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces to the *Consultant*:
 - .1 Visible defects are evident on vertical and horizontal surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm (39").
 - .2 Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
 - .3 When final coat on any surface exhibits a lack of uniformity of colour, sheen, texture, and hiding across full surface area.
- .5 Painted surfaces rejected by the *Consultant* shall be made good at the expense of the *Subcontractor*. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.
- .6 Painting *Subcontractor* shall obtain from *Contractor* written confirmation of specific surface preparation procedures and primers used for fabricated steel items from the fabricator/*Supplier* to ascertain appropriate and manufacturer compatible finish coat materials to be used before painting any such work.

3.6 Adjusting and Cleaning

- .1 Promptly as work proceeds and on completion of *Work*, remove paint where spilled, splashed or spattered during the progress of the *Work*. Keep the premises free from unnecessary accumulation of tools, equipment, surplus materials and debris; at the conclusion of the work leave the premises clean.

Painting

3.7 Exterior Paint Systems

- .1 System references listed are based on MPI Manual and are Premium Grade, High Performance Architectural, unless otherwise indicated:
 - .1 Structural steel and metal fabrications:
 - .1 EXT 5.1D Alkyd (over alkyd primer); gloss level: G5.
 - .2 Galvanized metal (not chromate passivated): (for high contact / high traffic area doors, frames, railings, misc. steel, pipes, etc.; for low contact / low traffic area overhead decking, ducts, gutters, flashing, etc.)
 - .1 EXT 5.3N Alkyd (over water based galvanized primer); gloss level: G5.

3.8 Interior Paint Systems

- .1 System references listed are based on MPI Manual and are Premium Grade, Low VOC (Green Seal GS-11), High Performance Architectural, unless otherwise indicated:
 - .1 Concrete masonry unit assemblies:
 - .1 INT 4.2D High performance architectural latex (over latex block filler); gloss level G4.
 - .2 Primed ferrous metal; touch-up and finish coats required under this section:
 - .1 Ferrous metal fabrications: Prepared and primed in accordance with Section 05 50 00.
 - .2 Ferrous architectural metal fabrications: Prepared and primed in accordance with Section 05 50 10.
 - .3 INT 5.1R High performance architectural latex (over alkyd primer); gloss level G5.
 - .3 Galvanized metal: (doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etc.)
 - .1 INT 5.3M High performance architectural latex (over water based galvanized primer); gloss level G5.
 - .4 Plaster and gypsum board: (gypsum wallboard, drywall and textured finishes)
 - .1 INT 9.2B High performance architectural latex finish (over latex primer/sealer):
 - .1 Gloss level:
 - .1 Walls, except as otherwise indicated: G4.
 - .2 Ceilings, except as otherwise indicated: G4.
 - .3 Wet and service areas; walls and ceilings: G4.
 - .2 Use high-hide primer sealer type at glass mat finished gypsum board.
 - .2 Standard gypsum board paint (PT):
 - .1 Acceptable Products:

Painting

- .1 Benjamin Moore 'Ecospec'.
- .2 Dulux 'Lifemaster'.
- .3 Gypsum Board Epoxy Paint System (EPT):
 - .1 Acceptable Products:
 - .1 PPG 'Pitt-Glaze WB1'.
 - .2 Sherwin-Williams 'Water Based Catalyzed Epoxy'.

3.9 Paint Schedule

- .1 Colour and gloss schedule:
 - .1 PT1/EPT1 - Sherwin Williams, Colour: SW 7005 Pure White (255-C1).
 - .2 PT2/EPT2 - Sherwin Williams, Colour: SW 7018 Dovetail (244-C5).
 - .3 PT3/EPT3 - Sherwin Williams, Colour: SW 6240 Windy Blue (224-C2).
 - .4 PT4/EPT4 - Sherwin Williams, Colour: SW 6179 Artichoke (213-C5).
 - .5 PT6/EPT6 - Colour to be later selected by *Consultant* to coordinate with adjacent wall graphic WP4d-1 and to match WP4c.
 - .6 PT7/EPT7 - Sherwin Williams, Colour: SW 7571 Casa Blanca (264-C4).
 - .7 PT8/EPT8 - Sherwin Williams, Colour to be later selected by *Consultant*.

END OF SECTION

SECTION 10 14 00 – WAYFINDING SIGNAGE

1 GENERAL

1.1 SUMMARY

- 1.1.1 Work related to this Section refers to the complete manufacture and installation of exterior and interior signage which may include, but is not limited to: Directional Signage, Amenity Signage, Regulatory and General Identification Signage.
- 1.1.2 Non-illuminated sign types utilizing materials primarily, but not limited to acrylic, faux-wood laminate, photopolymer, adhesive vinyl, aluminum and steel as well as providing structural support will form the basis of the Work.
- 1.1.3 Provide and install all support brackets, hardware and miscellaneous materials required to ensure a complete installation of all signs in accordance with requirements of the Contract Documents.

1.2 REFERENCE STANDARDS

- 1.2.1 Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. When a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion may be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement will govern. The publications listed form part of this specification to the extent of reference.
- 1.2.2 Applicable publications & codes:
 - 1.2.2.1 Accessibility for Ontarians with Disabilities Act (2005)
 - 1.2.2.2 Ontario Building Code (2012)
 - 1.2.2.3 Canadian Standards Association (CSA)
 - 1.2.2.4 American Society for Testing and Materials (ASTM):
 - 1.2.2.4.1 B209-96 Aluminum and Aluminum-Alloy Sheet and Plate
 - 1.2.2.4.2 B221-96 Aluminum and Aluminum-Alloy Extruded Bars, Rods Wire, Shapes and Tubes.
 - 1.2.2.4.3 A480/ Standard Specification for General Requirements for Flat-
 - 1.2.2.4.4 A480M-06b Rolled Stainless and Heat-Resisting STEEL Plate, Sheet, and Strip
 - 1.2.2.4.5 ASTM D635 Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
 - 1.2.2.4.6 ASTM D568 Rate of Burning and/or Extent and Time of Burning of Flexible Plastics in a Vertical Position
 - 1.2.2.4.7 ASTM D374 Thickness of Solid Electrical Insulation
 - 1.2.2.5 Ministry of Health and Long-Term Care's ("MoHLTC") OASIS standards
 - 1.2.2.6 National Fire Protection Association (NFPA)

1.3 SUBMITTALS

- 1.3.1 Submit in accordance with section below:
- 1.3.2 Product Data:
 - 1.3.2.1 Unless specified submit (3 sets).

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- 1.3.2.1.1 The Consultant and the Owner will retain (2 sets),
 - 1.3.2.1.2 The other will be reviewed and returned to the Contractor.
 - 1.3.2.2 Submit original shop drawings illustrating details of Work in .pdf format.
 - 1.3.2.3 Shop drawings, to be provided by the Contractor, will be used as the final construction documents and must include all construction, engineering and installation details for the complete production and erection of the designs described.
 - 1.3.2.4 The Contractor will provide dimensioned shop drawings for all signs, clearly showing elevations, sections, dimensions, materials, typographic layouts, fabrication methods, external finishes, anchorage, and other details of construction as well as details related to engineering and other construction responsibilities. Furnish location detailed drawings for signs supported or anchored to other substrates.
 - 1.3.2.5 Drawings will include complete details of fasteners (diameter, length, type, and material).
 - 1.3.2.6 The Contractor is responsible for ensuring they have the most current Design Drawings as well as any other applicable documents: such as architectural, structural and electrical drawings.
 - 1.3.2.7 The Contractor is responsible for ensuring that the appropriate fastening methods is used as required by the specific substrate that product is to be installed to.
 - 1.3.2.8 Shop drawings requiring engineering are to be reviewed and signed by a certified professional structural engineer recognized by the Province of Ontario.
 - 1.3.2.9 The Owner, Consultant or Construction Manager reserve the right to reject any shop drawing found not to meet standards as outlined in this document and / or deemed as unacceptable solutions for the project's overall design standards. Rejected shop drawings will require immediate resubmission with 5 working days, unless notified in writing and approved by the Owner, Consultant and/or Construction Manager, and will be furnished at no additional cost.
 - 1.3.2.10 Rejected or revised drawings will have all changes bubbled and noted, including the date of the change.
 - 1.3.2.11 The Consultant will provide a stamped and signed review of all drawings submitted complete with comments if required. The Contractor must have complete approval on all shop drawings prior to production.
 - 1.3.3 Samples:
 - Unless specified submit (3 sets).
 - 1.3.3.1 The Consultant/Owner will retain (2 sets),
 - 1.3.3.2 The other will be reviewed and returned to the Contractor.
 - 1.3.4 Provide typical color and material samples of sign types as shown on drawings:
 - 1.3.4.1 Samples to be supplied as 6" x 6" units
 - 1.3.4.2 Paint and finish samples are to be applied to typical material substrates used within the project to simulate final conditions.
 - 1.3.4.3 Vinyl and sheet samples to be provided unmounted to substrates.
 - 1.3.5 Approved sign samples will be the minimum workmanship and quality standard for reference until completion of the Work.
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- 1.3.6 Approved samples will be retained by the Contractor until released by the Consultant, at which time they may be incorporated into the permanent Work.
 - 1.3.7 Adjustments made on samples by the Consultant are not intended to change the Contract Price or Work. If adjustments affect the value of the Work, state such in writing for approval by the Construction Manager prior to proceeding.
 - 1.3.8 The Owner, Consultant or Construction Manager reserve the right to reject any sample or product found not to meet minimum quality and craftsmanship as outlined in this document and / or deemed inappropriate for the project's overall design standards. Rejected samples or products will require immediate resubmission with 5 working days; unless notified in writing and approved by the Owner, Consultant and / or Construction Manager, and will be furnished at no additional cost. The Contractor must have complete approval on all samples and products prior to production.
 - 1.3.9 Product and material manufacturer's printed specifications, anchorage details, installation and maintenance instructions are to be provided as part of the shop drawing submittal.
 - 1.3.10 Artwork:
 - 1.3.10.1 Electronic templates for artwork to be provided for each sign type. Templates will be provided to the Contractor as text editable Illustrator (.ai) files.
 - 1.3.10.2 Artwork of variations for message content to be laid out by the Contractor and provided for approval prior to production.
 - 1.3.10.3 All artwork to be submitted in either full size hardcopy or electronic form as Adobe PDF (.pdf).
 - 1.3.10.4 The Owner reserves the right to add and otherwise modify sign text and lettering layout during the submittal reviews at no additional cost to the Owner.
 - 1.3.10.5 Rejected or revised drawings will have all changes bubbled and noted, including the date of the change.
 - 1.3.10.6 The Contractor is to make the Consultant aware of any inconsistencies found in the design drawings; including but not limited to incorrect quantities, inconsistencies in the sign drawing, incorrect dimensions, installation or site conflicts, spelling, grammatical or font errors etc.
 - 1.3.11 Closeout Submittals:
 - 1.3.11.1 Final as built drawings are to be submitted upon completion of work and upon final approval. Drawings are to be submitted in electronic and hardcopy form to the Client. Drawings are to show details and notes including final as built conditions, designs, and included any site instructions and / or addenda required for the fabrication and installation of the products.
 - 1.4 QUALITY CONTROL
 - 1.4.1 The intent of the Contract Documents is to provide everything necessary for a complete contract. All drawings and specifications are mutually dependent. In the event of a discrepancy, or an error, neither document rules over the other. Notify in writing the Consultant if any discrepancies arise for direction on how to proceed.
 - 1.4.2 Notify the Consultant of any variations of conditions as shown on these drawings. It is the Contractor's responsibility to obtain and utilize the most current and up-to-date plans and specifications for all construction and installation work.
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- 1.4.3 Only superior quality work and materials to be used.
- 1.4.4 The Owner, Consultant, and/or Construction Manager reserve the right to reject any submittals, as well as any finished product or installation that does not meet or exactly equal the standard of quality established. Any such decision will be considered final and not subject to recourse.
- 1.4.5 A guarantee is required from the Contractor that only new materials is used unless otherwise specified.
- 1.4.6 Quality control inspection may take place at any time.
- 1.4.7 Claims for work carried out on instructions by others will not be accepted or honored.
- 1.4.8 Contractor to provide administration and inspection of all site Work.

1.5 DELIVERY, STORAGE, AND HANDLING

- 1.5.1 Signs will be packaged to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- 1.5.2 Deliver signs only when the site and mounting services are ready for installation work to proceed.
- 1.5.3 Store products in a dry condition within an enclosed facility.
- 1.5.4 Products will be secured to prevent willful damage and / or theft. Contractor to coordinate with the Construction Manager as to the possibility of on-site storage and / or work area, as required.
- 1.5.5 Delivery of materials and/or completed work will be coordinated with Owner. Costs for delivery, including labor to load, unload, and transportation, will be the responsibility of the Contractor.
- 1.5.6 All deliveries will be made during regular work hours. Deliveries made during extended or overtime hours will not be allowed without explicit approval by the Owner or Construction Manager and to be requested with a minimum of three (3) days advance notice.
- 1.5.7 The Contractor will confine operations at the site to areas permitted by law, ordinances, permits, and the Contract Documents and will not unreasonably encumber the site with any materials or equipment.

1.6 PERFORMANCE CRITERIA

- 1.6.1 Design Modifications:
 - 1.6.1.1 The Contractor will provide the sign products without design modifications from shop drawings or sample submittals.
 - 1.6.1.2 When design modifications made to drawings may be necessary to meet performance requirements, written notification / approval is required from the Consultant.

- 1.6.1.3 Variations in details and materials that do not adversely affect appearance, durability, strength or quality will be submitted to the Consultant for review. Every effort will be made to ensure the general design concept is maintained without alterations.

1.7 SUBSTITUTIONS – MATERIALS & PRODUCTS

- 1.7.1 The Contractor will carefully study the Contract Documents for the various signs and make specific recommendations for changes if he/she considers these changes will improve the quality of any sign. These recommendations for changes will be submitted in writing to the Owner & the Consultant before the preparation of shop drawings or fabrication of any samples or signs. No substitutions will be considered without samples.
- 1.7.2 Substitutions may be proposed under the following conditions:
 - 1.7.2.1 Substitutions satisfy all design conditions and other specified requirements.
 - 1.7.2.2 Substitutions should be equal or superior to materials specified.
 - 1.7.2.3 Substitutions will be considered if the nature of the change addresses but is not limited to: physical dimension requirements to satisfy the space limitations; static and dynamic weight limitations; structural properties; interchange ability of parts or components; accessibility for maintenance; possible removal or replacement; color, texture and compatibility with other materials.
 - 1.7.2.4 Substitutions due to delivery or availability will not to be grounds for additional claims to the contract price.

1.8 PROJECT CONDITIONS

- 1.8.1 The Contractor is responsible for ensuring that all site conditions have been thoroughly reviewed and coordinated prior to fabrication.
- 1.8.2 The Contractor is responsible for obtaining site measurements as noted in the design intent drawings and incorporating these measurements into the shop drawings.
- 1.8.3 The Contractor is responsible for coordinating with the Construction Manager and with other trades to ensure a successful fabrication and installation of all sign products. Coordination to include but not limited to running of conduit, wiring and data lines within sign structures; installation within wall cavities, ceilings, canopies, floor structures, off of columns or other building elements; avoidance of life safety or other impediments that affect installation; and any other activities that may be required to ensure a seamless integration of the signage program within the building envelope. Contractor may be required to furnish templates, support apparatus, blocking, and / or hardware prior to installation of the completed Work.

1.9 SCHEDULING

- 1.9.1 The Contractor will provide a complete and detailed schedule of all activities related to the fabrication and installation of sign products. This will include but is not limited to:
- 1.9.2 Submission of shop drawings
- 1.9.3 Submission of samples
- 1.9.4 Submission of prototypes

- 1.9.5 Fabrication of signs; Including key milestones such as acquisition of materials, fabrication of sign products, painting and finishing.
- 1.9.6 Installation; Including key milestones such as installation phasing, final installation of products, substantial completion.
- 1.9.7 The Contractor will ensure the scheduling of activities has been coordinated with other trades to ensure project timelines are met, completion of other trades Work that directly impacts sign installation, and other directives provided by the Consultant, Owner or Construction Manager such as building occupancy timelines.

1.10 WARRANTY

- 1.10.1 The Contractor will warrant the Work including all sub assemblies for a minimum period of two (2) years against defects and / or deficiencies in accordance with general conditions of the Contract unless otherwise directed. The Contractor is to provide warranties for components or products that make up the specific product that have shorter or longer terms than two (2) years. The Contractor is to promptly correct any defects or deficiencies that become apparent during the warranty period, to the satisfaction of Consultant or Owner and at no expense to Owner. Defects include but are not limited to; buckling, opening of seams, bond failure, color fading, mechanical failure, excessive wear, corrosion. Warranty to begin effective upon acceptance of substantial completion.

2 PRODUCTS

2.1 GENERAL

- 2.1.1 The Designs that make up the Contract are the property of the Owner and Consultant and not to be used for any other purpose than reference without express written permission of the Owners and Consultant.
- 2.1.2 Provide graphics items as completed units produced by a single manufacturer, including the necessary mounting accessories, fittings and fastenings.
- 2.1.3 Do not scale drawings for dimensions. Contractor to verify and be responsible for all dimensions and conditions shown by these drawings. Construction Manager and Consultant to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.
- 2.1.4 The Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the Work of the section, comply with the Contract Documents. The Contractor will further warrant that all components, specified or required to satisfactorily complete the installation, are compatible with each other and with conditions of installations.
- 2.1.5 The Contractor will obtain and pay for all necessary permits and variances. Costs associated with police, security, hydro or other services required for the transportation and / or installation is to be paid for by the Contractor
- 2.1.6 The Contractor is responsible for meeting all local and provincial building codes as well-established national standards and requirements.
- 2.1.7 Sign components presented in the Contract Document are for design intent purposes only. Duly reviewed, engineered shop drawings will be provided by the Contractor to be used as the final construction documents, and will include complete construction, engineering and installation details required for implementing the designs.

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- 2.1.8 The Contractor will furnish all labour, materials, equipment, tools, supplies and services necessary and reasonably incidental to complete fabrication, installation and delivery of sign(s) as specified. The Contractor is responsible for a complete and thorough job. Materials not specifically described but required for a complete and proper installation will be identified and provided for by the Contractor. The Contractor will be responsible for the quality of all materials and workmanship of any firms or individuals who act as a subcontractor. The Contractor will be responsible for providing subcontractors with complete and up-to-date drawings, specifications, sign schedules and other information issued for this project. The Contractor will be responsible for coordinating final review and approval of all copy wording with Consultant prior to beginning of fabrication.
- 2.1.9 Contractor to provide complete and comprehensive fabrication / installation liaison with all other trades. Where the Contractor is providing graphics only, it will be the Contractor's responsibility to schedule the Work to coincide with other trades' fabrication, finishing and installation schedules.
- 2.2 MATERIALS
- 2.2.1 Aluminum:
- 2.2.1.1 Aluminum sheet and plate 6063-T5 alloy or as otherwise specified.
- 2.2.1.2 Aluminum extrusions, tubes, bars, 6063-T5 alloy or as otherwise specified. Sizes, profiles, and shapes per Contract Documents as indicated, or as further developed for specified requirements.
- 2.2.1.3 Custom extrusion designs, provided, enhanced, and / or developed for Contract are, and will remain the property of the Owner.
- 2.2.1.4 Material to be mill finished unless specified. When the final product is to be exposed, a clear anodizing finish is to be applied.
- 2.2.2 Stainless Steel:
- 2.2.2.1 Stainless steel sheet and plate 316 alloy
- 2.2.2.2 Tubes Bars and Rods 316 alloy
- 2.2.2.3 Hardware unless noted to be 304 or 316 alloy
- 2.2.2.4 Material to be mill finished unless specified. When the final product is to be exposed, Excelsior 'XL Blend S' finish or approved equal to be used.
- 2.2.3 Steel:
- 2.2.3.1 General: Meet requirements of Sections 05 12 00 "Structural Steel Framing" and 05 12 01 "Architecturally Exposed Structural Steel".
- 2.2.4 Plastic:
- 2.2.4.1 General: Meet requirements of OBC Section 3.15.4 Plastic Sign Facing Materials, and 3.15.4.1 Combustible Sign faces.
- 2.2.5 Acrylic:
- 2.2.5.1 Cast or continuously manufactured polymethyl methacrylate (PMMA) acrylic that offers excellent optical clarity. Product to be UV resistant and meet or exceed code requirements on flammability and flame spread
- 2.2.5.2 Colored or opaque acrylics to provide uniform thickness and color density.
- 2.2.6 Lexan:
- 2.2.6.1 Manufactured polycarbonate resin thermoplastic (Lexan) that offers excellent optical clarity, Scratch resistance and tensile strength. Product to be UV resistant and meet or exceed code requirements on flammability and flame spread
- 2.2.6.2 Colored or opaque Lexan's to provide uniform thickness and color density.
- 2.2.7 Photopolymer:
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- 2.2.7.1 Exterior-grade photopolymer resin of photosensitive synthetic rubber compound monomers. Exterior rated after initial exposure to UV light and has a 0% swell rate in moisture-saturated environments.
 - 2.2.8 Applied Vinyl:
 - 2.2.8.1 2 mil, pressure-sensitive films designed for semi-permanent graphics that may be pre-spaced and electronically cut, screen printed or used in narrow width thermal transfer printing systems with a pressure sensitive adhesive. Films have the same color on both sides, have a transparent synthetic liner that resists moisture absorption and static buildup, lays flat for easier assembly of multicolor graphics, and allows superior cutting and weeding. Vinyl to be matt finish when ever possible and allow for removal and future updating.
 - 2.2.9 Paint:
 - 2.2.9.1 AKZO GripGard, Matthews Paint acrylic polyurethane, or approved equivalent complete with priming per manufacturers guidelines. Paint to be applied in a controlled environment and applied via spray unless otherwise required.
 - 2.2.9.2 A low VOC (volatile organic compounds) compliant coating which exceeds EPA standards for solvents and is an ultraviolet inhibited aliphatic, acrylic polyurethane system engineered for extreme color and gloss retention. Free of lead and heavy metal.
 - 2.3 FABRICATION
 - 2.3.1 Typography:
 - 2.3.1.1 All typographic layouts will utilize typeface specified in each sign type drawing. The Consultant will provide a sample version of the typeface.
 - 2.3.1.2 Contractor is responsible for acquiring translations for all signs requiring Braille as required. Final approved English messages are to be provided by the client / consultant for use.
 - 2.3.1.3 Letterforms and symbols must be photographically or digitally rendered in precise, crisp, clean forms. All letterforms will be free of ticks, discontinuous curves, line waves, cut or ragged edges, edge build-up, bleeding, surface pinholes, and other imperfections. Letterforms will conform to the prescribed proportions of the typographic font(s) specified by the Consultant.
 - 2.3.1.4 All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text will be a true, clean, accurate reproduction of typeface(s) shown. Text shown in drawings is for layout purposes only.
 - 2.3.2 Construction:
 - 2.3.2.1 Design components to allow for expansion and contraction for a minimum material temperature range as to be expected at the project site, without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
 - 2.3.2.2 Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible. Every effort shall be made to eliminate visible fasteners.
 - 2.3.2.3 Shop shall fabricate all products so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.
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- 2.3.2.4 Contact surfaces of connected members to be true. Assemble so joints will be tight and practically unnoticeable, without use of filling compound. Weld and grind smooth when possible.
- 2.3.2.5 Signs will have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces to be smooth, flat and without oil-canning, free of rack and twist.
- 2.3.2.6 Extruded members to be free from extrusion marks such as die lines, chattering, and surface defects. Square turns and corners sharp, curves to be true.
- 2.3.2.7 Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly eased (rounded). Form joints exposed to weather to exclude water.
- 2.3.2.8 Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly mitered to give appearance of solid material.
- 2.3.2.9 Movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components. Provide concealed and lockable access panels to provide service as required.

2.4 FINISHES

- 2.4.1 All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finish surfaces smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.
- 2.4.2 A suitable bond-break to be provided between all dissimilar materials to prevent galvanic reaction.
- 2.4.3 All inks and paints required for screened or imprinted surfaces will be a type made for the surface material on which it is to be applied and recommended by the manufacturer of the ink or paint. Exact identification of all ink and paint will be noted on the shop drawings, together with data describing the method of application, and, if other than "air" dried, drying method.
- 2.4.4 All screened inks made by a manufacturer with experience in production and consistency of such inks for the purpose and surfaces involved.
- 2.4.5 No paint, ink, or lacquer that will fade, discolor or de-laminate as a result of proximity to UV light source will be used.
- 2.4.6 All inks, paints and lacquers to be evenly applied and without pinholes, scratches, peeling, application marks, thinness etc.
- 2.4.7 All surfaces are to be sufficiently durable to withstand application and multiple removals of vinyl without defacing, or lifting of paint.
- 2.4.8 Finishes will be matt or eggshell with a maximum light reflectance value of 15%.

3 EXECUTION

3.1 INSTALLATION

- 3.1.1 Protect products against damage during field handling and installation. Protect adjacent existing and newly placed construction, landscaping and finishes as necessary to prevent damage during installation. Paint and touch up any exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- 3.1.2 Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned, signs to be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact Consultant and/or Construction Manager for clarification.
- 3.1.3 The Contractor is responsible for all signs that are damaged, lost or stolen while materials are on the job site and up until the completion and final acceptance of the job.
- 3.1.4 Remove or correct signs or installation work the Construction Manager determines as unsafe or as an unsafe condition.
- 3.1.5 At completion of sign installation, clean exposed sign surfaces. Clean and repair any adjoining surfaces and landscaping that became soiled or damaged as a result of installation of signs.
- 3.1.6 Locate signs as shown in the Location Plans (WS series of drawings). Sign positions are shown in approximate locations. Consult Architectural drawings for dimensioned sign locations.
- 3.1.7 The Contractor will be responsible for verifying that behind each sign location there are no utility lines that will be affected by installation of signs. Any damage to utilities during installation of signs will be the sole responsibility of the Contractor to correct and repair.
- 3.1.8 Furnish inserts and anchoring devices that must be set in concrete or other material for installation of signs. Provide setting drawings, templates, instructions and directions for installation of anchorage devices that may involve other trades. Ensure installation follows instruction as directed by engineers when applicable.
- 3.1.9 The Contractor is to protect goods supplied by him from damage during installation with appropriate insurance against fire, theft, or other damage. He will also protect from injury the property of the Owner, which may be adjacent, or with which he may come in contact, and he will make good any such damage occurring through his fault.
- 3.1.10 The Contractor will not use any hazardous substances in the manufacture of the signs, nor bring on site any hazardous substances, regulated under the environmental laws, without the express written consent of the Owner.
- 3.1.11 All exterior structure to support signage is the responsibility of the Contractor. All necessary blocking, plates or supports within the walls are to be the responsibility of the Contractor unless otherwise specified.
- 3.1.12 When installing signs in the vicinity of building expansion joints, consideration to be given to the movement created by the joints.
- 3.1.13 When installing signs to structural columns, slabs or other architectural elements the contractor is follow approved engineered drawings and coordinate with other trades to ensure structural integrity is not compromised.

3.2 EXAMINATION

- 3.2.1 Site verification of conditions: Verify actual site dimensions and location of adjacent materials prior to commencing work. Notify Consultant in writing of any conditions that would be detrimental to the installation. Commencement of work implies acceptance of previously completed work.
- 3.2.2 General signage locations are shown on signage plan drawings. Architectural elevations, floor plans and reflected ceiling plans are to be consulted for specific site, location, and elevation details.
- 3.2.3 The Contractor will notify the Construction Manager in writing of unacceptable substrates, detrimental conditions or dimensional discrepancies.
- 3.2.4 Beginning work indicates acceptance of substrate and subsequent modifications will become the Contractor's complete responsibility.
- 3.2.5 When not enough information has been provided for installation, the Contractor is responsible for determining the correct sign positioning with the Consultant or Owner prior to installation

3.3 PROJECT COMPLETION

- 3.3.1 The Contractor will arrange meetings with the Owner, Consultant and/or Construction Manager for a final on-site review of all completed and rectified sign products to ensure signs meet the Contract Documents and quality as approved and established; prior to application for a Certificate of Substantial Performance of the Work.

END OF SECTION

Phenolic Toilet Partitions

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Toilet partitions.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Show plan layout, elevations, hardware items, anchorage devices, dimensions, description of materials and finishes, and all other pertinent information.
- .4 Samples:
 - .1 Submit 3 samples of each colour of panel and samples of hardware items, and a typical base mounted sample of a pilaster and shoe.

1.3 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 *Subcontractor*:
 - .1 Has been regularly engaged in the assembly and installation of toilet partition systems.
 - .2 Shall demonstrate to the acceptance of the *Consultant* that they have successfully performed on comparable projects over the previous 5 years.

1.5 Delivery, Storage, and Handling

- .1 Cover exposed stainless steel surfaces with protective masking.

PART 2 - PRODUCTS

2.1 Materials

- .1 Acceptable *Products*:

Phenolic Toilet Partitions

- .1 Ceiling hung partitions:
 - .1 Bobrick 'DuraLine Series, Maximum Privacy, Class A'.
- .2 Solid phenolic material: Compact grade laminate. Solidly fused plastic laminate with matte-finish melamine surfaces, coloured face sheets, and black phenolic-resin core with exposed milled and polished black edges.
 - .1 Finished classification: Flame spread: 15, Smoke development: 25 (Tested in accordance to ASTM E 84)
 - .2 Impact resistance (Tested to ASTM D 2794): 168" lbf (pound force)
 - .3 Finished thicknesses:
 - .1 Pilasters and doors: 19 mm (3/4").
 - .2 Panels: 13 mm (1/2").
- .3 Colour: as selected by *Consultant* from manufacturer's full range.
- .4 Hardware:
 - .1 Continuous Bracket, Pedestal floor connections, L ceiling bracket, surface mount hinges, and continuous stainless steel H channel for vertical panel joints.
 - .2 Fabricate from heavy gauge, Type-304 stainless steel with satin finish.
 - .3 Conceal hardware inside compartments with the exception of out-swinging doors.
 - .4 Latch (vandal resistant):
 - .1 Sliding door latch: 2 mm (0.08") (14 gauge) and shall slide on nylon track.
 - .2 Sliding door latch shall require less than 2.3 kg (5-lb) force to operate. Twisting latch operation will not be acceptable.
 - .3 Latch track shall be attached to door by flathead machine screws into factory-installed threaded brass inserts.
 - .4 Latch handle shall have rubber bumper to act as door stop.
 - .5 Latch shall allow door to be lifted over 4.4 mm (0.2") (8 gauge) keeper for emergency access.
 - .6 Metal-to-metal connection shall withstand a direct pull of over 454 kg (1000 lb). per screw.
 - .5 Hinges (vandal resistant):
 - .1 Hinge: 16-gauge 1.6 mm (0.06") continuous self-closing piano hinge.
 - .2 Continuous piano hinge shall be attached to door and stile by theft-resistant, one-way, stainless steel machine screws into threaded brass inserts.
 - .3 Doors shall be provided with two 3 mm (0.1") (11 gauge) vinyl-coated door stops to resist door from being kicked out of compartment.
 - .4 Door stops and keeper: secured with stainless steel, one-way, machine screws from inside of compartment to threaded brass inserts.

Phenolic Toilet Partitions

- .6 Coat hook: constructed of stainless steel and shall project no more than 29 mm (1-1/8") from face of door. Coat hook shall be secured by theft-resistant, one-way stainless steel screws.
- .5 Mounting brackets: 1.2 mm (18-gauge) stainless steel and extend full height of panel. U-channels shall be furnished for panel to stile mounting. Angle brackets shall be furnished for stile to wall and stile to panel mounting. Angle brackets shall be furnished for panel to wall mounting.
- .6 Levelling device: 5 mm (3/16") hot rolled steel bar; chromate-treated and zinc-plated; through-bolted to solid phenolic stile.
- .7 Stile shoe shall be one-piece, 102 mm (4") high, Type 304, 0.8 mm (0.03") thick (22 gauge) stainless steel with satin finish. Top shall have 90° turn to stile. Shoe will be composed of one-piece of stainless steel and capable of being fastened by clip to stiles starting at wall line.
- .8 Provide with occupancy indicator latch by product manufacturer.
- .9 Overhead support steel framing: in accordance with Section 05 50 00.
- .10 Metal support systems and blocking: in accordance with Section 09 22 00.

PART 3 - EXECUTION

3.1 Installation

- .1 Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - .1 Maximum clearances:
 - .1 Pilasters and panels: 12.7 mm (1/2").
 - .2 Panels and walls, floors, and ceilings: 25.4 mm (1").
- .2 Install doors, pilasters, and side panels 25.4 mm (1") above finished floor.
- .3 Stirrup brackets: Secure panels to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel.
 - .1 Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - .2 Align brackets at pilasters with brackets at walls.
- .4 Ceiling-hung units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.
- .5 Install hardware components and partitions with fastenings and screws to manufacturer's written specification. Attach panel and pilasters to brackets with through type sleeve bolt and nut.
- .6 Secure wall brackets to blocking in steel stud walls.
- .7 Erect enclosures accurately to dimensions shown, plumbing securely, and anchoring in position. Hang doors; adjust hinges to perform as specified. Re-check doors for emergency feature.

Phenolic Toilet Partitions

- .8 Install system to be free of rattles and reverberations during normal usage.

3.2 Installation Tolerances

- .1 Install plumb, level, tight and secured. Comply with the following maximum tolerances:
 - .1 Plumb and level: 3 mm (1/8").
 - .2 Variation from indicated position: plus/minus 3 mm (1/8").

3.3 Adjusting and Cleaning

- .1 Hardware adjustment:
 - .1 Adjust hardware so that latches operate smoothly and without binding. Lubricate hardware if required by *Supplier's* requirements.
 - .2 Set hinges on out-swinging doors to return doors to fully closed position. Set hinges on doors with piano hinges to return doors to fully closed position.
- .2 Clean exposed surfaces using materials and methods recommended by manufacturer. Provide protection during remainder of construction period.

END OF SECTION

Corner Guards and Wall Protection

1.1 Summary

- .1 Section includes:
 - .1 Corner guards; CG1, CG2, CG3, CG4, CG5, CG6.
 - .2 Handrails; HR1.
 - .3 Crash and bumper rails; CR1/BR1, CR3/BR3.
 - .4 Chair rail; CH/RL1.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Samples:
 - .1 Submit 3 samples, 300 mm (12") long or 300 x 300 mm (12 x 12") in size as applicable, for each *Product* in specified finish.
- .4 Shop drawings:
 - .1 Include plans, elevations, hardware, and installation details.
 - .2 Show seam locations.
- .5 Templates:
 - .1 Submit templates to *Project Co.* for use by installers and fabricators as required for proper location and installation of hardware.

1.3 Quality Assurance

- .1 Mock-up:
 - .1 *Provide* full mock-up of each of the following types of wall protection specified in location as designated by *Consultant*.
 - .1 Handrails.
 - .2 Crash and bumper rails.
 - .3 Corner guards.
 - .2 Mock-up may be incorporated in the completed work upon acceptance of *Consultant*.

1.4 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 Deliver *Products* to location at the *Place of the Work* designated by *Project Co.*

Corner Guards and Wall Protection

PART 2 - PRODUCTS

2.1 General

- .1 Incorporate reinforcing, fastenings and anchorage required for building-in of *Products*.
- .2 For the work of this Section, provide products by one manufacturer.

2.2 Corner Guards

- .1 CG1:
 - .1 Surface mounted, 75 mm (3") legs, full height from base to ceiling, extruded thermoplastic.
 - .1 Colour: Acrovyn, White #949.
 - .2 Angles: Allow for 90° and wider angles.
 - .3 Full height, except where indicated otherwise.
 - .4 Acceptable *Products*:
 - .1 Acrovyn 'TFC'.
 - .1 Thickness: 1.02 mm (0.040").
 - .2 Construction Specialties 'Model SM-20N'.
 - .3 Inpro Architectural Products '130 High Impact Corner Guard'.
 - .4 Substitutions: In accordance with Section 01 25 00.
- .2 CG2 and CG3:
 - .1 Surface mounted, full height from base to ceiling, stainless steel, No.4 satin finish.
 - .2 Legs:
 - .1 CG2: 38 mm (1-1/2").
 - .2 CG3: 89 mm (3-1/2").
 - .3 Acceptable *Products*:
 - .1 Construction Specialties Acrovyn Model CO-8.
 - .2 Inpro Corporation 'Surface Mount Stainless Steel Corner Guard'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .3 CG4 and CG5:
 - .1 Surface mounted, U-shaped full height from base to ceiling, stainless steel, No.4 satin finish.
 - .2 Legs:
 - .1 CG4: 38 mm (1-1/2").
 - .2 CG5: 89 mm (3-1/2").
 - .3 Acceptable *Products/Manufacturer*:

Corner Guards and Wall Protection

- .1 Construction Specialties 'Model CO-8', custom shaped and size.
- .2 Inpro Corporation 'Surface Mount Stainless Steel Corner Guard', custom shaped and size.
- .3 Substitutions: in accordance with Section 01 25 00.
- .4 CG6:
 - .1 Surface mounted, angles at 135 degrees, full height from base to ceiling, stainless steel.
 - .2 Acceptable *Products*:
 - .1 Construction Specialties Acrovyn Model SCO-8.
 - .2 Inpro Corporation 'Surface Mount Stainless Steel Corner Guard'.
 - .3 Substitutions: in accordance with Section 01 25 00.
 - .5 Adhesives: type as recommended by corner guard manufacturer.
 - .6 Sealants: in accordance with Section 07 92 00.

2.3 Handrail

- .1 HR1:
 - .1 Surface mounted, 110 mm (4-5/16") height x 41 mm (1-5/8") gripping diameter, extends 79 mm (3-1/8") from wall, with continuous extruded aluminium retainer/bracket, and snap-on covers.
 - .2 Handrail shall be continuous around corners as required.
 - .3 Accessories:
 - .1 End caps.
 - .2 Brackets.
 - .3 Mounting system accessories as *Provided* by manufacturer.
 - .4 Texture: Pebblette.
 - .1 Colour: Taupe 0113.
 - .2 Acceptable *Products*:
 - .1 Inpro Architectural Products '1000BH Ligature Resistant Handrail'.
 - .2 Substitutions: In accordance with Section 01 25 00.

2.4 Crash Rails and Bumper Rails

- .1 CR1/BR1, 2 rails – one serving as rail and one as a bumper guard:
 - .1 Surface mounted, 200 mm (8") high maximum, extruded thermoplastic applied moulding. Manufacturer's standard mounting hardware.
 - .2 Colour: 262 Driftwood.
 - .3 Profile:

Corner Guards and Wall Protection

- .1 Curved:
 - .1 *Acceptable Products:*
 - .1 Construction Specialties 'SCR-80N'.
 - .2 Inpro Architectural Products '1800 Series'.
 - .3 Substitutions: In accordance with Section 01 25 00.
- .2 CR3/BR3, 2 rails – one serving as rail and one as a bumper guard:
 - .1 Stainless steel crash rail, 150 mm (6") high, with rounded edges, Type 304, #4 satin finish.
 - .2 *Acceptable Product:*
 - .1 Construction Specialties 'Model ECR-60S Series'.
 - .2 Substitutions: In accordance with Section 01 25 00.
- .3 SS bumper rail:
 - .1 Floor mounted.
 - .2 *Acceptable Product:*
 - .1 Construction Specialties 'Model ECR-6SF'.
 - .2 Substitutions: In accordance with Section 01 25 00.
- .4 Accessories:
 - .1 Fasteners: manufacturer's standard to provide, concealed, flush mounting.

2.5 Chair Rail

- .1 CH/RL1:
 - .1 Surface mounted, 100 mm (4") high, with continuous aluminum retainer and regrind PVC free cushion.
 - .2 *Acceptable Product:*
 - .1 Construction Specialties 'Model SCR-40N'.
 - .1 Colour: 949 White, Suede Texture.
 - .2 Inpro Architectural Products '1400 Series'.
 - .3 Substitutions: In accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Installation

- .1 Install work to meet manufacturer's written requirements, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.
- .2 Clean substrates to remove dirt, debris and loose particles prior to installation.
- .3 Fit joints and junction between components tightly and in true planes.

Corner Guards and Wall Protection

- .4 Install units on solid backing as indicated, and erect with materials and components straight, tight and in alignment.
- .5 Bumper guards, hand rails, and crash rails:
 - .1 Mechanically fasten wall guards, hand rails, crash rails and bumper rails with top surface parallel to finished floor line to height indicated.
 - .2 Install straight and level to a tolerance of plus or minus 3 mm (1/8") over 3000 mm (10') straight edge, non-cumulative. Maximum 32" o.c. spacing of handrail supports as per product manufacturer.
- .6 Corner guards:
 - .1 Corner guard edges shall be smooth.
 - .2 Fastening type: in accordance with manufacturer's written installation requirements:
 - .1 Adhere corner guards with continuous adhesive beads in accordance with manufacturer's written requirements.
 - .2 Adhere corner guards with self-adhesive tape backing in accordance with manufacturer's written requirements.
 - .3 Mechanically fasten corner guards in accordance with guard manufacturer's written requirements. Fasteners shall be aligned and equally spaced.
 - .3 Visible fasteners are not permitted.
 - .4 Install corner guard shall be tightly fitted without gaps.

END OF SECTION

Washroom and Miscellaneous Accessories

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Washroom and miscellaneous accessories (CS/CI).
 - .2 Coordination and installation of washroom accessories as supplied by *Owner* (OS/CI).
- .2 Section excludes:
 - .1 MIR 1; frameless mirror: in accordance with Section 08 80 00.

1.2 Administrative Requirements

- .1 Coordination:
 - .1 Supply manufacturer's handling instructions, anchorage information, roughing-in dimensions, templates and service requirements for installation of the 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.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Samples:
 - .1 Submit 3 samples of each finish specified.
- .4 Shop drawings:
 - .1 Include plans, elevations, hardware, and installation details.

1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.5 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 Deliver products to location at the *Place of the Work* designated by *Contractor*.

Washroom and Miscellaneous Accessories

PART 2 - PRODUCTS

2.1 Accessories

- .1 Incorporate reinforcing, fastenings and anchorage required for building-in of *Products*.
- .2 Washroom accessories; locations as indicated or scheduled (CS/CI).
 - .1 BCT 1; Baby change station:
 - .1 Typical allocation: Family washroom, universal washroom.
 - .1 Polypropylene, surface mounted.
 - .1 ASI '9012'.
 - .2 ASI '9014'.
 - .3 Bobrick 'KB300'.
 - .4 Bradley '9612'.
 - .2 Grab bars:
 - .1 Straight grab bars:
 - .1 GB1:
 - .1 Typical allocation: Horizontally behind toilets in 2 pc and 3 pc accessible and universal washrooms; vertically either side of accessible urinals.
 - .2 Length: 610 mm (24").
 - .3 Acceptable *Products*:
 - .1 ASI '3801-24P'.
 - .2 Bobrick 'B-6806.99 x 24'.
 - .3 Bradley 'Bradex 812-2, 001-24'.
 - .2 GB1B:
 - .1 Heavy duty grab bar, horizontal or vertical orientation, tested to support minimum 1000 lbs.
 - .2 Length: 610 mm (24").
 - .3 Acceptable *Products*:
 - .1 Bradley '812-2, 001-24'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .3 GB4:
 - .1 Orientation: Vertical.
 - .2 Length: 600 mm (24").
 - .3 Acceptable *Products*:
 - .1 Gamco 'Grab Bar Straight 150 Series'.
 - .2 Substitutions: in accordance with Section 01 25 00.

Washroom and Miscellaneous Accessories

- .2 L-shaped grab bars:
 - .1 GB3:
 - .1 Typical allocation: Next to toilets in 2 pc and 3 pc accessible and universal washrooms.
 - .2 Size: 760 mm x 760 mm (30" x 30").
 - .3 Acceptable *Products*:
 - .1 ASI '3804-P'.
 - .2 Bobrick 'B-6898.99 30x30'.
 - .3 Bradley '812-2, 057'.
 - .3 GB5- MH; Grab bar, MH, horizontal, no pass through:
 - .1 Typical allocation: High risk washrooms.
 - .2 Length: 610 mm (24").
 - .3 Acceptable *Product*:
 - .1 Kingsway Grab Bar 'KG270-272'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .4 GB3-MH, GB6-MH; Grab bar; MH, L-shape, no pass through:
 - .1 Typical allocation: High risk washrooms.
 - .2 Size: 760 mm x 760 mm (30" x 30").
 - .3 Acceptable *Product*:
 - .1 Kingsway Grab Bar 'KG279C'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .3 JS 1; Janitor's shelf with mop holders:
 - .1 Typical allocations: Housekeeping rooms/closets
 - .2 Acceptable *Products*:
 - .1 ASI '1315-4'.
 - .2 Bobrick 'B-224'.
 - .3 Bradley '9933'.
- .4 Mirrors:
 - .1 MIR 2:
 - .1 Type 304 Stainless steel angled framed mirrors:
 - .2 Acceptable *Products*:
 - .1 ASI '0600-2436'.
 - .2 Bobrick 'B-2908 2436'.
 - .3 Bradley '780-2436-2'.

Washroom and Miscellaneous Accessories

- .2 MIR3-MH:
 - .1 Typical allocations: MH Washrooms.
 - .2 Acceptable *Products*:
 - .1 ASI '105-14'.
 - .2 Bobrick 'B942'.
 - .3 Bradley 'SA05'.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .5 Clothes/robe hook:
 - .1 RH 1; single hook:
 - .1 Typical allocations: Staff WRs, Offices, Meeting Rooms.
 - .2 Acceptable *Products*:
 - .1 ASI '7340-S'.
 - .2 Bobrick 'B-6717'.
 - .3 Bradley '9114'.
 - .2 RH1-MH; dual hook:
 - .1 Acceptable *Product*:
 - .1 Kingsway 'KG177 Anti-Ligature Dual Coat Hook rack'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .3 RH 2-MH; collapsible hook:
 - .1 Typical allocations: MH washrooms, all MH Spaces where indicated.
 - .2 Acceptable *Product*:
 - .1 Kingsway 'KG180 Anti-Ligature Single Coat Hook'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .6 Shelves:
 - .1 SHLF 2; metal:
 - .1 Size: 127mm (5") depth x 457mm (18") length
 - .2 Typical allocations: WRs and Housekeeping rooms.
 - .3 Acceptable *Products*:
 - .1 ASI '0692-518'.
 - .2 Bobrick 'B-298x18'.
 - .3 Bradley '755-18'.
 - .2 SHLF 3-MH:
 - .1 Shelf, recessed, stainless steel.

Washroom and Miscellaneous Accessories

- .2 Typical allocations: WRs, MH.
- .3 *Acceptable Product*:
 - .1 ASI '130 Recessed Shelves'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .3 Washroom accessories supplied by *Owner* installed by *Construction Manager* locations as indicated or scheduled (OS/CI):
 - .1 CHDIS-1:
 - .1 *Acceptable Product*:
 - .1 SJS 'Diversey J-Fill QuattroSelect Dispensing System – SafeGap'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 GD 1; Glove Dispenser:
 - .1 Glove dispenser, holder for 3 sizes of gloves.
 - .2 *Acceptable Products*:
 - .1 Clear PETG:
 - .1 Medline 'MDS193096B Clear PETG horizontal glove box holder'.
 - .2 Bowman 'GP-015 – Glove Box Dispenser – Triple'.
 - .3 Hand sanitizer dispenser:
 - .1 HS 1:
 - .1 Typical application throughout; All will be surface mounted (not in recessed cubby)
 - .2 Colour: to later selection by *Consultant*.
 - .3 *Acceptable Product*:
 - .1 Gojo 'ADX-12 Dispenser, Model 8884-06'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 HS 2 - MH:
 - .1 Hand sanitizer dispenser, sloped top, touch free activated, surface mounted, with no floor/wall protector.
 - .2 Typical application MH spaces.
 - .3 *Acceptable Product*:
 - .1 Gojo 'Purell LTX Behavioural Health Dispenser'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .4 Paper towel dispensers:
 - .1 PTD1; Paper towel dispenser for paper towel rolls, larger scale, no touch:
 - .1 Colour: Dark grey.

Washroom and Miscellaneous Accessories

- .2 *Acceptable Product:*
 - .1 Cascades Pro 'Tandem – Mechanical No-Touch Roll Towel Dispenser, Model C340'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .2 PTD 2-MH; Paper towel dispenser, surface mounted, anti-ligature, lockable:
 - .1 Typical allocations: MH washrooms.
 - .2 *Acceptable Product:*
 - .1 Behavioral Safety 'Ligature Resistant Toilet Paper Dispenser, #TR230'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .5 S/C 1; Sharps containers:
 - .1 Sharps containers – Medium size, surface mounted
 - .2 Typical allocation: bedrooms, exam rooms, etc.
 - .3 *Acceptable Product:*
 - .1 Daniels 'S14 - 1.35Gallon Reusable Sharps Container'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .6 Soap dispenser:
 - .1 SD 1; surface mounted:
 - .1 Typical allocation: Sinks including Hand Hygiene Stations
 - .2 *Acceptable Product:*
 - .1 Gojo 'ADX-12 Dispenser, Model 8884-06'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .2 SD 2-MH: Soap dispenser, manual.
 - .1 *Acceptable Product:*
 - .1 Kingsway Group 'KG07 Manual Soap Dispenser'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .7 SDH1; Soap/shampoo dish/holder:
 - .1 Typical allocation: Shower Areas
 - .2 Colour: to later selection by *Consultant*.
 - .3 *Acceptable Product:*
 - .1 Gojo 'ADX-12 Dispenser, Model 8884-06'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .8 Toilet tissue roll holders:
 - .1 TPH 1:

Washroom and Miscellaneous Accessories

- .1 Toilet paper holder, surface mounted, smaller scale, double rolled side by side.
- .2 Typical allocations: Public and staff washroom.
- .3 Colour: Smoke.
- .4 Acceptable *Product*:
 - .1 Georgia-Pacific 'Sofpull Centerpull Mini Side-by-Side Tissue Dispenser, GP56516'.
 - .2 Substitutions: in accordance with Section 01 25 00.
- .2 TPH 2-MH:
 - .1 Toilet paper holder, recessed.
 - .2 Typical allocations: MH Washrooms.
 - .3 Acceptable *Products*:
 - .1 Kingsway 'KG13 Ligature Resistant Toilet Roll Holder'.
 - .2 Substitutions: in accordance with Section 01 25 00.

2.2 Fabrication

- .1 Fabricate *Products* with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that washroom accessories will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.

PART 3 - EXECUTION

3.1 Preparation

- .1 Verify that rough-in dimensions and blocking or back-up has been provided to comply with product manufacturer's written requirements.

3.2 Installation of Washroom and Miscellaneous Accessories

- .1 Supply manufacturer's handling instructions, anchorage information, roughing-in dimensions, templates and service requirements for installation of the 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.
- .2 Comply with product manufacturers written requirements.
- .3 Install and secure fixtures rigidly in place using expansion shields in solid masonry or concrete, toggle bolts in hollow masonry or sheet metal screws at metal studs.
- .4 Insulate surfaces to prevent electrolytic action due to contact with dissimilar metals, or concrete or masonry as applicable. Use bituminous paint or other approved means.
- .5 Install on built-in concealed solid backing materials. Grab bar installation shall be able to withstand 250 kg downward force.

Washroom and Miscellaneous Accessories

- .6 Verify locations and mounting heights with *Consultant* before roughing-in.

3.3 Barrier Free Installation Heights

- .1 Install accessories to permit operable parts and controls to be accessed in accordance with authorities having jurisdiction.

3.4 Installation Tolerances

- .1 Install accessories plumb, level, straight, tight and secured, centred between joints on masonry and tile walls to the following maximum tolerances:
- .1 Plumb and level: 3 mm (1/8").
 - .2 Variation from indicated position: 3 mm (1/8").

3.5 Adjusting and Cleaning

- .1 Verify under work of this section that installed *Products* function properly, and adjust them accordingly to ensure satisfactory operation. Test mechanisms, hinges, locks, and latches and adjust and lubricate to ensure washroom accessories are in perfect working order.
- .2 Do not remove protective coatings until final cleaning, or earlier if directed by *Consultant*.
- .3 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at *Place of the Work* only if approved.

END OF SECTION

Prefinished Metal Lockers

PART 1- GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Prefinished metal lockers; LKR-1.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Clearly indicate, materials, finishes, fabrication details, dimensions, thicknesses, plans, elevations, hardware, and installation details.
- .4 Samples:
 - .1 Submit 3 samples of each finish specified.
- .5 Templates:
 - .1 Submit templates to *Contractor* for use by installers and fabricators as required for proper location and installation of hardware.

PART 2- PRODUCTS

2.1 Materials

- .1 LKR-1; Lockers:
 - .1 Type: Single tier.
 - .2 Size (width x depth x height):
 - .1 305 mm x 450 mm x 1830 mm (12" x 18" x 72").
 - .3 Colour: to later selection by the *Consultant*.
 - .4 Accessories: shelf, 3 coat hooks and rod per locker provided by manufacturer.
 - .5 Basis of design:
 - .1 Uline 'Model H-7584'.
 - .2 Substitutions: in accordance with Section 01 25 00.

Prefinished Metal Lockers

PART 3 - EXECUTION

3.1 Installation

- .1 Submit manufacturer's 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.
- .2 Install work to meet manufacturers' recommended specifications, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.
- .3 Include reinforcing, anchorage and mounting devices required for the installation of each *Product*.
- .4 Fit joints and junction between components tightly and in true planes, conceal and weld joints where possible.
- .5 Fabricate *Products* with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that specified items will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.
- .6 Supply handling instructions, anchorage information, roughing-in dimensions, templates and service requirements for installation of the 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.
- .7 Back paint components where contact is made with building finishes to prevent electrolysis.

3.2 Adjusting and Cleaning

- .1 Verify under work of this section that installed *Products* function properly, and adjust them accordingly to ensure satisfactory operation.
- .2 Do not remove protective coatings until final cleaning in accordance with Section 01 77 00, or earlier if directed by *Consultant*.
- .3 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at *Place of the Work* only if approved.

END OF SECTION

Solid Phenolic Lockers

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Solid phenolic lockers; LKR-2.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
 - .1 Indicate thicknesses of panels, fabricating methods, assembled banks of lockers, bases, trim, numbering, filler panels, end panels, and manufacturer's installation instructions.
- .4 Samples:
 - .1 Submit sample of colour and finish.

PART 2 - PRODUCTS

2.1 Materials

- .1 LKR-2; Lockers:
 - .1 Type: 2-tier locker.
 - .2 Size: 380 mm wide x 450 mm deep x 1830 mm high (15" x 18" x 72").
 - .3 Solid phenolic:
 - .1 Moisture resistant wood core with a fire retardant plastic laminate, white interior, black locker body edgeband, and door edges with matching PVC colour edgeband thermally fused.
 - .2 Finish: Smooth.
 - .3 Colour: White.
 - .4 Locking system: Digital combination.
 - .5 Hinges: Soft close type, commercial hinges, provide 4 per door for doors over 1525 mm (60").
 - .6 Coat hooks: Manufacturer's standard hooks and shelf, 1 per locker:
 - .1 Wall hook right.
 - .2 Ceiling hook.
 - .3 Mini support shelf.

Solid Phenolic Lockers

- .7 Base: Manufacturer's recessed base with leveling feet, and finished trim.
- .8 Acceptable *Product*:
 - .1 Spacesavers 'Club'.
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Installation

- .1 Assemble and install lockers complete with bases in accordance with manufacturer's written installation requirements.
- .2 Securely fasten at least every third locker through to wall studs, masonry or concrete substrate.
- .3 Install trim and filler panels where required for continuous appearance and where obstructions occur. Specific conditions as indicated.
- .4 Install finished end panels to exposed ends of locker banks.

3.2 Installation Tolerances

- .1 Install plumb, level, tight and secured.
- .2 Comply with the following maximum tolerances:
 - .1 Plumb and level: Maximum 3 mm (1/8").
 - .2 Variation from indicated position: plus/minus 3 mm (1/8").

END OF SECTION

Wheelchair Shelter

PART 1 - GENERAL

1.1 Summary

.1 Section includes:

- .1 Wheelchair shelter.

1.2 Submittals

.1 Submit required submittals in accordance with Section 01 33 00.

.2 *Product* data sheets:

- .1 Submit product data sheets and include installation instructions for products.

.3 Shop drawings:

- .1 Submit engineered shop drawings.
- .2 Include plans, elevations, fabrication details, hardware, and project specific installation details not covered in product data sheets.

.4 Samples:

- .1 Submit 2 samples of each finish specified.

.5 Templates:

- .1 Submit templates to *Contractor* for use by installers for proper location and installation of hardware.

1.3 Closeout Submittals

.1 Submit closeout submittals in accordance with Section 01 77 00.

.2 Operation and maintenance data:

- .1 Submit operation and maintenance data for incorporation into maintenance manual.

PART 2 - PRODUCTS

2.1 Wheelchair Shelter

- .1 Width: 1830 mm (72").
- .2 Length: 2440 mm (96").
- .3 Columns: 64 mm (2-1/2") x 64 mm (2-1/2").
- .4 Roofing: White flat pan aluminum.
- .5 Wall glazing: Clear acrylic.
- .6 Configuration:
 - .1 Full side walls with open front.
- .7 Finish: Powder coat painted finish.

Wheelchair Shelter

- .8 Accessories: anchor boots, hardware, and integral gutter, provided by manufacturer.
- .9 Acceptable *Product*:
 - .1 Brasco International Inc. 'Slimline Flat'.
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3 - EXECUTION

3.1 Installation

- .1 *Provide* manufacturer's 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.
- .2 Install products in accordance with manufacturer's written requirements, true, tightly fitted, and level or flush to installation surfaces.
- .3 Incorporate reinforcing, fastenings and anchorage required for building in of *Products*.

3.2 Adjusting and Cleaning

- .1 Verify under work of this section that installed *Products* function properly, and adjust them accordingly to ensure satisfactory operation.

END OF SECTION

Medical Headwalls

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Medical headwalls.
 - .1 Type M1 – Modular Headwall Assembly.
 - .2 Type M2 – Horizontal Recessed Service Consoles.

1.2 Administrative Requirements

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

1.3 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
 - .2 Submit equipment manufacturer's handling and installation instructions, anchorage information, roughing-in dimensions, service requirements for installation of the work of this section.
 - .3 Submit equipment manufacturer's product data sheets for patient bed headwall systems and accessories that include product characteristics, performance criteria, physical sizes, finish and limitations, and installation instructions.
- .3 Shop drawings:
 - .1 Submit engineered shop drawings, including seismic design, connections and restraint, for the following:
 - .1 Headwall systems, including seismic anchoring and connections for the work of this section.
 - .2 Clearly indicate, materials, finishes, fabrication details, dimensions, thicknesses, plans, elevations, hardware, fastenings, service connections and installation details.
 - .3 Include dimensions, details of construction, mounting details, front view, side view, equipment and device arrangement, piping and wiring diagrams including termination points, material, and connection diagrams.
 - .4 Show all devices inclusive of types of devices, locations of utility outlets, locations of accessories, and interface with related services which require cutting or close fitting,
 - .5 Indicate termination/connection points of services for headwalls.
 - .6 Indicate proposed site connections, fasteners and methods.

Medical Headwalls

.4 Samples:

- .1 Submit duplicate 305 mm x 305 mm samples of finished fascia panel colours, textures and finishes and 305 mm long samples of trim options for selection by Consultant. For each colour selection required, submit colour chips representing manufacturer's full range of available colours and finish.

.5 Certificates: Submit certification by installer that equipment has been properly installed, adjusted, and tested in accordance with manufacturer's recommendations.

.6 Installer qualifications: Submit letter verifying installer's experience with work similar to work of this Section

.7 Templates:

- .1 Submit templates to *Contractor* for use by installers and fabricators as required for proper location and installation of equipment.

1.4 Closeout Submittals

.1 Submit closeout submittals in accordance with Section 01 77 00.

.2 Operation and maintenance data:

- .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

1.5 Quality Assurance

.1 Single source responsibility: Provide materials of this Section from a single manufacturer.

.2 Qualifications:

.1 Installers / applicators / erectors:

- .1 *Provide* the work of this section, executed by competent installers with minimum 10 years experience in the application of the *Products*, systems, and assemblies specified and with approval and training of *Product* manufacturers.

.2 Manufacturer:

- .1 Provide products by a firm specializing in the fabrication of patient headwall systems who has successfully produced work similar in design and extent to that required for the project, in not less than three (3) projects of similar size and scope and whose work has resulted in construction with a record of successful in service performance for a minimum period of five (5) years.
- .2 Manufacturer shall have implemented a program of continuous quality management conforming to the requirements of ISO 9001. Submit proof of certification upon request. Mock-ups:

- .3 Mock-up of complete installation of each type of headwall, in location as directed by *Consultant*.

Medical Headwalls

1.6 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 Deliver products to location at the *Place of the Work* designated by *Contractor*.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements:

- .1 Products shall meet requirements of municipal, provincial or federal authorities having jurisdiction. As a minimum, patient bed service panels shall comply with the following:
 - .1 CSA Z7396.1-17.
- .2 Flammability of finishes: conforming to requirements of authorities having jurisdiction. Provide finishes with following flame-spread rating and smoke developed classification when tested in accordance with CAN/ULC S102-10:
 - .1 Flame spread: maximum 25.
 - .2 Smoke developed: maximum 450.

2.2 Medical Headwalls

- .1 Subject to compliance with requirements, provide products by one of the following manufacturers:
 - .1 Amico Corporation.
 - .2 Class 1 Inc.
 - .3 Interspec.
 - .4 Medical Design.
- .2 Modular headwalls; Type M1.
 - .1 Basis of design: Amico 'Serenity Series'.
 - .1 Orientation:
 - .1 Vertical / wall.
 - .2 Mounting:
 - .1 Surface-mounted panel wall system.
 - .2 Flammability:
 - .1 Maximum values in accordance with CAN/ULC-S102-10:
 - .1 Flame Spread Value (FSV): Maximum 150.
 - .3 Modular wall panels:
 - .1 Provide panel wall system consisting of removable vertical sections installed on extruded aluminum frames via steel spring clip system. Design sections such that they can be removed without the need for special tools.

Medical Headwalls

- .2 Use hardware in assembling components and connecting panels that allows for repeated assembly, disassembly and reconfiguration.
- .3 Provide units complete with structural frames, access panels, electrical outlets, electrical back boxes, wiring and services.
- .4 Reveals and joints that align and are coordinated with other features in the room such as; bed bumpers and sheet wall protection.
- .5 Fascia: 10 mm thick fire retardant MDF with plastic laminate finish.
- .6 Plastic laminate panel finish: ANSI/NEMA LD 3-2005, Horizontal General Purpose Grade (HGS).
 - .1 Type 1: Formica Milk 9634-58.
 - .2 Type 2: Antique White.
- .4 Integrated accessory rails: Design rail system with no sharp edges to meet infection prevention and control requirements and to provide easy access for cleaning purposes.
 - .1 Manufacturer's standard vertical and horizontal type, extruded aluminum rails to suit project requirements.
 - .2 Provide accessory rails as shown on Drawings integrated into aluminum extrusion assembly with no mechanical screws used to affix rail to headwall.
 - .3 Finish: clear etched anodized finish.
- .5 Accessories:
 - .1 Glove dispenser holder: manufacturer's standard.
 - .2 Hand sanitizer holder: manufacturer's standard.
 - .3 Sphygmomanometer holder: manufacturer's standard.
 - .4 Bumper guard – (117213.1):
 - .1 Horizontal bed bumpers shall be constructed of a vinyl cover with PETG.
 - .2 Horizontal bed bumper system shall offer protection to a wall or Headwall System against bed impact.
 - .3 Horizontal bed bumpers protrude 50 mm (2") from the wall and are 100 mm (4") wide. Standard height of 508 mm (20") but can be customized
- .3 Horizontal Recessed Service Consoles – Type M2:
 - .1 Amico 'Majestic Series – Recessed Single Tier Headwall'.
 - .2 Materials and construction:
 - .1 Enclosure shall be constructed of extruded, anodized aluminum alloy sections to provide a modular unit with integrated accessory rails for equipment management.
 - .2 Integrated accessory rails: Provide system with 2 horizontal accessory channels integrated into aluminum extrusion assembly, clear etched anodized finish.

Medical Headwalls

- .3 Laminated fascia: Aluminum strips with high pressure laminate, colour and pattern as selected by *Consultant*.
- .4 Covers and end caps: Top and bottom cover panels fabricated from powder coated extruded aluminum, with injection moulded ABS fire retardant plastic end caps.
- .5 Headwall length: as indicated on drawings.

2.3 Components

- .1 Service chase: Constructed of 6063-T5 extruded aluminum, with passage space for conduit and medical gas piping. High pressure laminate faced MDF panel inserts shall finish exposed front, laminate colour/pattern to match fascia.
 - .1 Chase width: as indicated on drawings.
- .2 Medical gas and vacuum outlets: Shop fabricate headwall with medical gas and vacuum outlets.
- .3 Medical gas manifold:
 - .1 Factory supplied, installed and manifolded for single point connection by headwall manufacturer.
 - .2 Degreased, Type L hard copper pipe to extend from each terminal unit to a common access point for on-site connection by medical gas *Subcontractor*.
 - .3 Piping shall be labelled per CSA Z7396.1-17 and capped for cleanliness.
 - .4 Medical gas outlets shall be serviceable without removal of nameplate or gas specific components, complete with CSA Z7396.1-17 certification.
 - .5 Medical gas fittings: in accordance with Section 22 63 02.
 - .6 Piping interface with building piping located 500 mm above headwall.
- .4 Electrical wiring:
 - .1 Comply with requirements of authorities having jurisdiction and with requirements of Divisions 26, 27, and 28.
 - .2 Wire for standard and critical branch power circuits shall be #10 type THHN stranded copper wire, 600 volt, with heat resistant thermoplastic insulation for hot (black) and neutral (white).
 - .3 Grounds shall be #10 type R THHN stranded copper wire (green). Ground conductors shall be installed in conduit.
 - .4 Nurse call system and communication devices and wiring.
 - .1 Nurse call and code devices shall be supplied, installed, wired and tested on-site by work of Divisions 26, 27, and 28.
 - .5 Grounding and bonding:
 - .1 Ground conductors shall be installed in conduit. Each power receptacle shall have a ground conductor connected to a grounding screw. A grounding bus shall be installed in each device barrier box at rough-in locations, and shall be installed as to insure grounding for complete power system.

Medical Headwalls

- .5 Electrical receptacles/switches:
 - .1 HUBBELL Hospital Grade 15 amp or 20 amp, 120 volt or 277 volt, ULC listed and marked Hospital Grade.
 - .1 Quantity and type as indicated on drawings.
 - .2 Headwall manufacturer shall furnish and install receptacles with required wiring, as indicated on drawings.
 - .3 Coordinate work of this section with Divisions 26, 27, and 28:
 - .1 Duplex receptacles: NEMA style 5-15R or 5-20R as indicated on Drawings, White colour, for use on normal power circuits, and Red colour for use on critical branch power circuits.
 - .1 Quantity and type as indicated on drawings.
 - .2 Safety receptacles: Duplex type, NEMA style 5-15R or 5-20R as indicated on Drawings, White colour for use on normal power circuits, and Red colour for use on Vital branch power circuits. Receptacles shall limit proper access to energized contracts and shall accept both 2 wire and 3 wire plugs.
 - .3 Locking receptacles; if referenced on Drawings: Simplex type, 20 amp, 120 volt or 277 volt, Black colour, HUBBELL 'HBL23000HG'.
 - .4 Low voltage data provisions:
 - .1 Connect to device junction box via conduit or raceway. Headwall manufacturer shall include pull cord extending from junction box to service provision.
 - .2 Telephone jack, blank faceplates, data port or other low voltage device shall be furnished, installed and wired by low voltage *Subcontractor*.
 - .5 Switches:
 - .1 Refer to headwall Drawings for locations where required.
 - .2 HUBBELL Industrial Grade 120 volt or 277 volt, 15 amp or 20 amp. Switch type SPST, 3-way or momentary, as indicated on drawings.
 - .3 Low voltage switches shall be 0 - 12 volt, 15 amp unless otherwise indicated. Headwall manufacturer shall furnish, pre-install and wire switches.
 - .6 Outlet, data, and switch plate covers: Stainless steel.

PART 3 - EXECUTION

3.1 Installation

- .1 Install equipment in accordance with equipment manufacturer's written requirements and in accordance with reviewed shop drawings.
- .2 Submit manufacturer's information and templates required for installation of work of this section. Assist or supervise, or both, the setting of anchorage devices, and construction of other work incorporated with *Products* specified in work of this section in order that they function as intended.

Medical Headwalls

- .3 Include reinforcing, anchorage and mounting devices required for the installation of each *Product*.
- .4 Verify locations and mounting heights with *Consultant* before roughing-in.
- .5 Electrical *Subcontractor* shall be responsible for final electrical hook-up at service connection locations, as well as interconnection wiring on multi-sectional units and testing, in accordance with authorities having jurisdiction and with requirements of Divisions 26, 27, and 28. Coordinate work of this section with work of Divisions 26, 27, and 28.
- .6 Mechanical *Subcontractor* shall be responsible for final mechanical service connections and testing, in accordance with authorities having jurisdiction and with requirements of Divisions 21, 22, and 23. Coordinate work of this section with work of Divisions 21, 22, and 23.
- .7 Install and make connections as required for a complete and operational headwall system for each unit.
- .8 Fit joints and junction between components tightly and in true planes, conceal and weld joints where possible.
- .9 Headwall acoustic insulation: Fill headwall cavity with headwall acoustic insulation. Coordinate with services running in the headwalls, including mechanical ductwork.

3.2 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

3.3 Adjusting and Cleaning

- .1 Upon completion of installation, inspect finishes and materials for damage and faulty installation. Make good or replace damaged finishes and materials as directed by *Consultant* at no cost to *Owner*.
- .2 Verify under work of this section that installed *Products* function properly, and adjust accordingly to ensure satisfactory operation.
- .3 Do not remove protective coatings until final cleaning in accordance with Section 01 77 00, or earlier if directed by *Consultant*.

3.4 Closeout Activities

- .1 Demonstration and training:
 - .1 Before acceptance of system, arrange for demonstration of system with authorized representatives of *Owner*, to be performed by competent representative of equipment manufacturer to assure proper function, operation and explanation. Give *Owner's* representative a minimum of 10 days advance notice in writing of demonstration date.
 - .2 Demonstrate in presence of *Owner's* representative operation of equipment following installation. Demonstrations shall be made:
 - .1 When *Work* is completed.

Medical Headwalls

- .2 When *Work* is turned over to *Owner*.
- .3 Responsible representatives of fabricators and installers of equipment being tested shall be present at demonstrations.
- .4 Conduct comprehensive demonstration for *Owner's* staff on operation and care of equipment.
- .5 Provide demonstration and training in accordance with Section 01 79 00
- .2 Testing:
 - .1 Test and commission equipment in accordance with equipment manufacturer's written requirements.

END OF SECTION

Aggregates: General

1 GENERAL

1.1 References

- .1 ASTM D 4791-10, Test Method for Flat or Elongated Particles in Coarse Aggregate.

1.2 Samples

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Allow continual sampling by Consultant during construction.
- .3 Provide Consultant with access to source and processed material for sampling.
- .4 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

2 PRODUCTS

2.1 Materials

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
 - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.

Aggregates: General

2.2 Source Quality Control

- .1 Inform Consultant of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
- .2 If, in opinion of the Consultant, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise the Consultant 10 working days in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

3 EXECUTION

3.1 Preparation

- .1 Aggregate source preparation
 - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by Consultant.
 - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
 - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
 - .4 When excavation is completed dress sides of excavation to nominal 3:1 slope, and provide drains or ditches as required to prevent surface standing water.
 - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
- .2 Processing
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified.
 - .3 Wash aggregates, if required to meet specifications.
 - .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

Aggregates: General

.3 Handling

- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.4 Stockpiling

- .1 Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules and requirements.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Consultant within 48 hours of rejection.
- .6 Stockpile materials in uniform layers of thickness as follows:
- .1 Max 1.5m for coarse aggregate and base course materials.
- .2 Max 1.5m for fine aggregate and sub-base materials.
- .3 Max 1.5m for other materials.
- .7 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .8 Do not cone piles or spill material over edges of piles.
- .9 Do not use conveying stackers.
- .10 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
- .11 Direct surface water away from stockpile site so as to prevent erosion or deteriorations of materials.

3.2 Cleaning

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles.
- .3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

Aggregates: General

3.3 Stockpile Cleanup

- .1 Remove stockpile, leave area in a clean and neat conditions. Grade site surface to prevent free standing surface water.

END OF SECTION

Site Clearing

1 GENERAL

1.1 References

.1 Definitions:

.1 Clearing:

.1 General clearing: consists of cutting off trees, brush and shrub vegetative growth above ground and disposing of felled trees, live or dead plant material, previously uprooted trees and stumps, exposed visible boulders and surface debris rubbish, as well as fences and incidental structures as necessary to complete the Work.

.2 Clearing isolated trees: consists of cutting off of designated trees, and disposing of felled trees and debris.

.3 Underbrush clearing: consists of removal from treed areas of undergrowth, deadwood and trees smaller than specified trunk diameter and disposing of fallen timber and surface debris.

.2 Grubbing:

.1 General grubbing: consists of excavation and disposal of stumps, roots, exposed visible boulders, and rock fragments.

.3 Other Reference Standards:

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.2 U.S. Environmental Protection Agency (EPA) / Office of Water

.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.2 Existing Conditions

.1 Known underground and surface utility lines and buried objects are not necessarily as indicated on the Contract Drawings. The Contractor shall establish the exact locations of these utilities and objects in the field.

.2 Stantec does not guarantee the accuracy of the existing information shown on the Contract Drawings and accepts no responsibility for damages, if any, suffered by any party as a result of decisions made or actions taken based on the information presented within the Contract Drawings and Documents.

Site Clearing

- .3 It is the responsibility of the Contractor to inform themselves of the exact locations of, and assume all liability for damages to all utilities, services and structures, whether above ground or below grade before commencing the work. Such information is not necessarily shown on the Contract Drawings, and where shown, the accuracy cannot be guaranteed.

1.3 Administrative Requirements

- .1 Locate, identify and protect existing utilities designated to remain.
- .2 Identify site features, planting and buildings designated to remain.

1.4 Delivery, Storage and Handling

- .1 Clean-up waste resulting from site clearing operations continuously with the progress of the work.
- .2 Remove materials offsite to authorized disposal site.

2 PRODUCTS

2.1 Site Clearing

- .1 Site clearing: as required to achieve specified performance criteria; functionally compatible with adjacent materials and components.

3 EXECUTION

3.1 Utility Lines

- .1 Locate and protect utility lines.
 - .1 Preserve in operating condition active utilities traversing site.
- .2 Notify utility authorities before beginning work on site.

3.2 Preparation

- .1 Prevent damage to fencing, trees, landscaping, natural features, benchmarks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are designated to remain.
- .2 Protect benchmarks, property corners, and survey monuments from damage or displacement. If marker needs to be removed, reference and replace it by licensed land surveyor.

Site Clearing

- .3 Temporarily cover catch basins and maintenance holes to prevent entry of debris. Ensure adequate surface drainage in affected area is maintained.
- .4 Temporary Erosion and Sedimentation Control:
 - .1 Implement temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways according to the approved plan.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 Clearing

- .1 Sod stripping and removal: strip sod to topsoil.
- .2 General clearing:
 - .1 Remove trees, brush, shrubs, down timber, rotten wood, rubbish, and other vegetation, as well as fences and incidental structures.
- .3 Clearing isolated trees: cut trees and grub out tree stump.
- .4 Underbrush clearing: clear underbrush to ground level.
- .5 Grubbing:
 - .1 Grub out stumps and roots entirely.
 - .2 Grub out exposed visible boulders and rock fragments greater than 300 mm but less than 1 m in diameter.
- .6 Use only hand methods for grubbing inside drip lines of trees which are to remain.

3.4 Finish

- .1 Leave ground surface in condition suitable for immediate grading operations.

3.5 Field Quality Control

- .1 Provide verification and review of site clearing and submit reports, in acceptable format, to verify compliance of work with contract.

Site Clearing

3.6 Cleaning

- .1 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.
- .2 Leave Work area clean at end of each day.
- .3 Clean and reinstate areas affected by Work.
- .4 Remove recycling and compost containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Removal of Existing Asphalt Pavement

1 GENERAL

1.2 Protection

- .1 Protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Contract Administrator at no additional cost.

1.3 Measurement for Payment

- .1 Removal of existing asphalt pavement will be measured in square metres of surface actually removed regardless of depth removed.
- .2 Payment under this item will include operations involved in removing, hauling and stockpiling designated pavement and cleaning of remaining pavement surface.

2 PRODUCTS

- .1 Not applicable to this section.

3 EXECUTION

3.1 Preparation

- .1 Prior to commencing removal operation, inspect and verify with Contract Administrator areas, depths and lines of asphalt pavement to be removed.

3.2 Equipment

- .1 Use cold milling, planing or grinding equipment with automatic grade controls capable of operating from a stringline, and capable of removing part of pavement surface to depths or grades indicated.

3.3 Removal

- .1 Remove existing asphalt pavement to lines and grades indicated or established by Contract Administrator in field.
- .2 The existing asphalt shall be neatly sawcut to provide a clean vertical edge and to prevent breaking of the asphalt.
- .3 Use equipment and methods of removal and hauling which do not tear, gouge, break or otherwise damage or disturb underlying pavement.

Removal of Existing Asphalt Pavement

.4 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.5 Provide for suppression of dust generated by removal process.

3.4 Stockpiling of Material

.1 Dispose of removed asphalt pavement by stock-piling in location[s] on site designated by Contract Administrator.

.2 Removed asphalt pavement which is to be recycled in hot mix asphalt concrete under this contract may be stockpiled at designated asphalt plant site.

.3 Construct stockpiles in accordance with Section 31 05 16 – Aggregates: General.

3.5 Sweeping

.1 Sweep remaining surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

3.6 Finish Tolerances

.1 Finished surfaces in areas where asphalt pavement has been removed to be within +/- 5 mm of grade specified but not uniformly high or low.

END OF SECTION

Sitework Demolition and Removal

1 GENERAL

1.1 References

The latest editions of the following codes and standards at time of tender shall apply unless otherwise indicated:

- .1 Canadian Federal Legislation
 - .1 Canadian Environmental Protection Act (CEPA), 1988.
 - .2 Canadian Environmental Assessment Act (CEAA), 1995.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992.
 - .4 Motor Vehicle Safety Act (MVSA), 1995.

1.2 Storage and Protection

- .1 Protect in accordance with Section 31 23 16 - Excavation, Trenching and Backfilling.
- .2 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Consultant and at no cost to Owner.
- .3 In all circumstances ensure that demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .4 Do not dispose of waste of volatile materials such as, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout the project.
- .5 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
- .6 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
- .7 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .8 Ensure the temporary guards, hoardings are provided during and upon completion of work in accordance with applicable safety regulations.

Sitework Demolition and Removal

1.3 Existing Conditions

- .1 Visit the site and the existing structures on site so as to fully understand all existing conditions and extent of work required. No increase in cost or extension of performance time will be considered for failure to know conditions.
- .2 Prior to the start of any demolition work remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of at designated disposal facilities in safe manner in accordance with TDGA and all other applicable regulatory requirements.

1.4 Regulatory Requirements

- .1 Ensure all work is performed in compliance with CEPA, CEAA, TDGA, MVSA, and all applicable provincial regulations.

1.5 Submittals

- .1 Submit for approval drawings, diagrams or details showing sequence of disassembly work or supporting structures and underpinning. Drawings for structural elements shall bear seal and signature of professional engineer licensed to practice in Ontario.
- .2 Prepare and submit a waste reduction workplan. Describe management of demolition wastes. Identify materials which can be reused, recycled and indicate method proposed for reducing, reusing recycling wastes.

1.6 Coordination

- .1 Coordinate all demolition and modification work with any new work to be performed to facilitate completion. Demolition work cannot start until approved by Consultant. Coordination is required with the Consultant and the Owner.
- .2 Coordinate modification work and demolition to allow continuous, uninterrupted operation of the existing facility.

2 PRODUCTS

1.7 Equipment

- .1 Equipment and heavy machinery used to meet or exceed all applicable emission requirements.
- .2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Sitework Demolition and Removal

3 EXECUTION

3.1 Preparation

- .1 Inspect site with Consultant and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

3.2 General Demolition Requirements

- .1 The general area in which the demolition work is to be performed shall be left clean and free of debris at the end of each shift; access routes must always be kept clear. If required, the general area shall be graded as required to provide a uniform appearance.
- .2 All backfilling required in the demolition area shall conform to the governing requirements of the Site Earthwork Section.
- .3 Demolish existing work as indicated and as required to accommodate new work.
- .4 Demolish work in a safe and systematic manner, from top to bottom.
- .5 Do not throw or drop demolished materials from heights. Use chutes, conveyors or hoisting equipment to lower materials.
- .6 Demolish in a manner to minimize dusting. Keep dusty materials wetted but prevent flooding or contaminated runoff.
- .7 Demolish masonry and concrete elements in small sections. Carefully remove and lower structural framing and other heavy and large objects.
- .8 At all times leave work in safe condition, so that no part is in danger of uncontrolled toppling or falling.
- .9 Install temporary supports as required to prevent uncontrolled collapse of structures. Design of support to be completed by Professional Engineer. Submit certified drawings for review.
- .10 Security of the facility and operation must always be provided.

Sitework Demolition and Removal

3.3 Monitoring Wells Decommissioning

- .1 Existing monitoring wells shall be decommissioned by a licensed well technician as per the requirements of Ontario Regulation 468/10 (formerly O.Reg. 903).
- .2 A decommissioning water well record shall be provided by the licensed well technician.
- .3 All necessary utility locates shall be obtained by the Contractor.

3.4 Concrete Structures Demolition

- .1 Existing concrete structures, as noted, shall be removed to the limits indicated.
- .2 Existing concrete to be removed shall be cut into fragments and reduced in size as required to facilitate removal and disposal.
- .3 Disassembly, removal of all structural elements shall be carried out under the supervision of a professional structural engineer licensed to practice in Ontario hired by the Contractor.

3.5 Piping And Equipment Demolition

- .1 Be responsible for the removal of process equipment, pumps and associated motors, piping and valves, and all other appurtenances associated with the item being removed.
- .2 Existing piping shall be cut, removed, abandoned, disconnected, and/or salvaged as indicated on the drawings or as required.
- .3 Piping and equipment shall be disconnected, dismantled and removed as required and in such a manner as to minimize disturbance or damage to adjacent construction.
- .4 At any point or location where new work is to be connected or installed, the removal of existing work shall be done so as to facilitate the new installation work to the maximum possible extent.

3.6 Site Work Demolition

- .1 The demolition of existing drives, curbs, walks, dikes, and similar items shall be scheduled and performed so as to minimize inconvenience to the Owner.
- .2 The demolition of existing underground services including piping and chambers shall be coordinated so as to ensure the continual unhindered operation of the services, allow for efficient changeovers from existing to new underground services and to minimize inconvenience to the Owner.

Sitework Demolition and Removal

3.7 Repair of Existing Construction

- .1 Where structures to be demolished are connected to structures to remain, remove the existing construction in a careful manner so that adjacent construction, piping, or facilities to be left in place are not cracked or otherwise damaged.
- .2 The Contractor will be held responsible for any damage thereto because of his operations.
- .3 Use temporary supports designed by a Professional Engineer, where and as required for the support of existing facilities.
- .4 Holes and damage resulting from removal operations shall be filled, reconstructed, repaired, and finished to match and conform to adjacent surfaces and construction as determined by the Engineer.

3.8 Items to be Salvaged by Contractor

- .1 Removal and salvage of any item of equipment or facility includes removal and salvage of all accessories, piping, wiring, supports, associated electrical starters and devices, base plates, and frames, and all other appurtenances, unless otherwise directed.
- .2 Existing materials and equipment removed, and not reused as a part of the work, shall become the Contractor's property, except for the items indicated by the Owner shall remain the Owner's property and shall be delivered to the Owner to a designated area by the Contractor in good condition.
- .3 Existing materials and equipment to be removed by the Contractor, and reused as a part of the work shall remain the property of the Owner.
- .4 The Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified herein or indicated to be salvaged and reused or to remain the property of the Owner.
- .5 The Contractor shall store and protect salvaged items specified or indicated to be reused in the work.
- .6 Any items damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by the Contractor in kind or with new items.
- .7 The Contractor may, at his option, furnish and install new items in lieu of those specified or indicated to be salvaged and reused, in which case such removed items will become the Contractor's property.

Sitework Demolition and Removal

- .8 All other existing materials and equipment removed by the Contractor shall not be reused in the work, shall become the property of the Contractor, and shall be removed from the jobsite.

3.9 Restoration

- .1 Restore areas and existing works outside areas of demolition to conditions that existed prior to commencement of work. Level of compaction for restorations are to match requirements of section 31 22 19 3.7.1.2
- .2 Use only soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.10 Cleanup

- .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.
- .2 Use only cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.11 Reporting

- .1 Record off-site removal of debris and materials and provide following information regarding removed materials to Consultant within 24 hours.
 - .1 Time and date of removal
 - .2 Type of material
 - .3 Weight and quantity of materials
 - .4 Final destination of materials
- .2 The Contractor is responsible for ensuring all reporting requirements are fulfilled to the satisfaction of Owner and/or the Consultant.

END OF SECTION

Site Earthwork

1 GENERAL

1.1 References

- .1 The Contractor shall carry out all grading and compaction in accordance with Ontario Provincial Standard Specification (OPSS) 206.

1.2 Soil Inspection and Testing

- .1 Inspection and compaction testing shall be carried out by an inspection and testing agency designated by the Consultant and approved by the Owner.

1.3 Protection

- .1 Protect legal iron bars, existing trees, landscaping, bench marks, buildings, pavement, surface or underground utility lines which are designated to remain. If damaged, restore to original or better condition.

1.4 Regulatory Requirements

- .1 Obtain necessary permits for work of this Section. Give required notices.

2 PRODUCTS

2.1 Material

- .1 Additional fill material as required – Granular B in accordance with OPSS 1010 or as recommended by the Geotechnical Engineer.
- .2 The Contractor shall supply and install all fill required and obtain approval from the Owner's material testing agency of all material used as fill for grading Work prior to placing same and shall protect approved material from contamination.

2.2 Material Source

- .1 The Contractor shall be responsible for determination of location, suitability, and quantity of available material before tendering, including cost and amount of Work required to crush, screen, wash or clean or otherwise process material and cost of hauling of materials from source to the job site.

Site Earthwork

2.3 Imported Fill

- .1 Prior to importing any soil or granular fill material, provide analytical data to demonstrate that the material meets the Ministry of Environment Table 1 Site Condition Standards for concentrations of metals, general inorganic parameters (including electrical conductivity, sodium absorption ratio and pH), polycyclic aromatic hydrocarbons, benzene, toluene, ethylbenzene and xylenes, and petroleum hydrocarbons. A minimum of three samples representative of the material to be imported must be taken by a qualified consultant. The environmental consultant retained by the Owner shall develop an appropriate testing protocol and frequency based on the source of the material.
- .2 Prior to importing any backfill material, obtain the approval of the Consultant for the chosen facility and material.

3 EXECUTION

3.1 General

- .1 The Contractor shall inspect the site and verify items designated for removal and items to be preserved.
- .2 Locate all underground utilities in Work areas.
- .3 Strip topsoil and grass, weeds and roots to a minimum depth of 300 mm, reuse as fill in landscape areas or dispose off site.
- .4 Complete site clearing work before commencement of earthwork.

3.2 Preparation

- .1 The Contractor shall:
 - .1 Slope rough grade to match existing surrounding site conditions.
 - .2 Place fill materials in loose layers not exceeding 200 mm in depth and compact each layer to the specified compaction ratio before placing subsequent layers.
 - .3 Compact fill materials only when the moisture content is suitable for obtaining the specified density. When the moisture content is too low, apply water by means of an approved distributor. When the moisture content is too high, thoroughly mix the wet fill with dry materials or dry the fill material by blading, dicing, or other methods.

Site Earthwork

3.3 Surplus Material

- .1 Remove surplus material from site.

3.4 Removal

- .1 The Contractor shall:
 - .1 Not disturb adjacent items, including buried utilities, designated to remain in place.
 - .2 Square up adjacent surfaces to remain in place.
 - .3 Do not contaminate existing granular materials that the Contractor intends to be incorporated into the Work.
 - .4 Remove foundation elements including but not limited to pole bases and foundation walls down to at least 0.5 m depth below final design grade.
 - .5 Not disrupt active or energized utilities traversing premises.
 - .6 Make good any over demolition at no cost to the Owner.

3.5 Salvage

- .1 The Contractor shall carefully dismantle items containing materials designated for salvage and store said materials in a safe protected area.

3.6 Disposal Of Material

- .1 The Contractor shall:
 - .1 Dispose of all materials off site that are not designated for salvage or re-use in Work.
 - .2 Excavated granular materials shall be stockpiled in designate areas and disposed off-site only when deemed in excess.
 - .3 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labeling and provision of material safety data sheets acceptable to Labour Canada and Health and Welfare Canada.

3.7 Backfill

- .1 The Contractor shall:
 - .1 Backfill in accordance with Section 31 23 16– Excavation, Trenching, and Backfilling.
 - .2 After placing each layer of base material, compact the layer to 100% of maximum density at optimum moisture content as determined by Standard Proctor Test (ASTM D698-78).

Site Earthwork

3.8 Restoration

- .1 The Contractor shall, upon completion of the Work, remove debris, trim surfaces and leave Work site clean.

END OF SECTION

Excavation and Backfill

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Excavation and backfilling for work in areas within building footprint.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Material test reports: For each material proposed for backfill as follows:
 - .1 Classification according to ASTM D2487-17.
 - .2 Laboratory compaction curve according to:
 - .1 Standard Proctor Maximum Dry Density (SPMDD): in accordance with ASTM D698-12(2021).

PART 2- PRODUCTS

2.1 Materials

- .1 Granular A fill: OPSS 1010 - November 2013, Granular A.
- .2 Granular B fill: OPSS 1010 - November 2013, Granular B Type I.
- .3 Granular B fill: OPSS 1010 - November 2013, Granular B Type II.
- .4 Clear stone: OPSS 1004 - November 2012, Clear Stone, 19 mm (3/4") Type 1.
- .5 Native fill: Clean (meeting chemical criteria for residential land use), native soil, excavated at *Place of the Work*, as selected and approved by geotechnical engineer.
- .6 Engineered fill: as selected and approved by geotechnical engineer.as selected and approved by geotechnical engineer.
- .7 Moisture content of fill shall be within 2% of optimum moisture density test (ASTM D698-12(2021)).
- .8 Obtain fill materials from sources approved by geotechnical engineer. Submit reports for acceptance prior to importing fill.

PART 3 - EXECUTION

3.1 Dewatering

- .1 Bail, pump out or divert water from excavations, from whatever cause, as it accumulates, and until the permanent drainage is operational and foundations are in place.

3.2 Excavating

- .1 Excavate to elevations and dimensions required for installation, construction and inspection of the *Work*. Remove and dispose of waste, soil and like materials from the *Place of the Work* and pay dumping costs.

Excavation and Backfill

- .2 Removal of existing boulders and/or concrete elements up to a size of 1 m³ (1.3 yd³), encountered below existing grade while excavating, are included as part of the *Work*.
- .3 Notify *Consultant* at each time of occurrence when existing boulders and/or concrete elements greater than 1 m³ are encountered below existing grade, providing detailed record of each occurrence in writing. This record must be approved by the *Consultant* before claims for extras will be considered.
- .4 If upon excavating to the specified elevations, it is found that existing conditions are not fulfilled, adjust the excavations accordingly, but only with the written authorization of the *Consultant*.
- .5 Remove water, disturbed soil or foreign matter from footing excavations before placement of reinforcement or concrete.
- .6 During cold weather, prevent soil which will be adjacent to or beneath concrete from freezing.
- .7 Excavation will not be considered complete until the soil at founding elevation is inspected and approved by the geotechnical engineer.

3.3 Backfilling

- .1 Commence backfilling after areas of *Work* to be backfilled have been inspected, and pipe and conduit joints tested and accepted by *Consultant*.
- .2 Areas to be backfilled shall be free from debris, snow, ice, water or frozen ground. Backfill material shall not be frozen or contain ice, snow or debris.
- .3 Prior to placing fill under concrete slabs, proofroll the subgrade as directed by the geotechnical engineer. Remove soft, wet, or other deleterious material and replace with approved fill compacted to 100% of its Standard Proctor Maximum Dry Density, or import granular fill to stabilize the subgrade, and form a working mat, under the supervision of geotechnical engineer.
- .4 Backfill simultaneously each side of walls and other structures to equalize soil pressures.
- .5 Obtain *Consultant's* acceptance prior to placing backfill against foundation walls enclosing interior space.
- .6 Request reviews by *Consultant* and geotechnical engineer of excavation prior to beginning backfilling.
- .7 Where temporary unbalanced earth pressures are liable to develop on walls or other structures, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by *Consultant*.
- .8 Place and compact fill materials in continuous horizontal layers not exceeding Geotechnical engineer recommended loose depth thickness.
- .9 Use backfilling methods to prevent disturbing or damaging buried services and site improvements.

Excavation and Backfill

3.4 Fill Types and Compaction

- .1 Dimensions specified in following paragraphs are minimum dimensions of fill after compaction.
- .2 Compaction shall be to applicable Standard Proctor Maximum Dry Density (SPMDD).
- .3 Concrete floor slab base course:
 - .1 Provide base course In accordance with section 03 30 00 for preparation for slab on grade and recommended by Geotechnical Engineer.
 - .2 *Provide* minimum 150 mm (6") base course of 19 mm (3/4") clear stone fill to underside of slab, and below slab on grade vapour barrier where indicated. Vibrate into place to achieve uniform support for concrete slab and place to allow maximum concrete floor slab thickness tolerance of ± 10 mm (3/8") in accordance with CSA-A23.1-09.
- .4 Backfill against foundation walls:
 - .1 *Provide* Granular B fill material, compacted to at least 95% SPMDD and recommended by Geotechnical Engineer.

3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 In-situ tests and inspections:
 - .1 Allow independent inspection and testing company to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
 - .2 Footing subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by *Consultant*.
 - .3 Inspections:
 - .1 Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - .2 Determine that fill material and maximum lift thickness comply with requirements.
 - .3 Determine, that in-place density of compacted fill complies with requirements.
 - .4 Testing:
 - .1 Testing company will test compaction of soils in place according to requirements of *Contract Documents*.

3.6 Protection

- .1 Protect excavated areas from exposure to sun and rain which would cause cave-ins or softening of beds on which foundations and drains rest. Prevent flow of water and earth fines into excavated pits and trenches. Seal or divert flow from springs that fill excavations.

Excavation and Backfill

- .2 Protect bottoms of excavations from softening. Should softening occur, remove softened soil and replace with approved material.
- .3 Protect bottoms of excavations from freezing.
- .4 Effect measures to minimize dust as result of the *Work*.

END OF SECTION

Excavation, Trenching & Backfilling

1 GENERAL

1.1 Section Includes

- .1 Excavating, trenching, backfilling, and compacting for watermains, sewers, and other utilities.
- .2 Excavating and backfilling for new roadway and parking lot.
- .3 Sub-grade preparation below roadway and parking lot.

1.2 Administrative Requirements

- .1 Visit and examine the site and note all characteristics and features which may affect the Work of this Section. The information shown on the drawings and soil report is provided for the guidance of the Contractor but shall in no way relieve him of the responsibility for determining the nature of the conditions of the site.
- .2 No allowance will be made for difficulties encountered or expenses incurred resulting from conditions known, visible or which can be reasonably construed at time of bid.

1.3 Utility Lines

- .1 Before commencing excavation, check locations of utilities and report any serious discrepancies to the Consultant. Engage the services of local Public Utilities Commission, Hydro, Telephone, Gas and all other authorities to accurately determine location of any underground services.
- .2 Before undertaking mass excavations, expose, support and protect any buried services.
- .3 Take care not to damage or displace encountered services, whether known or unknown.
- .4 When such services are encountered during the execution of Work immediately notify the Consultant and protect, brace and support active services.
- .5 In case of damage to an essential service, notify the Owner immediately and repair the service as per the Owner's direction, and to the approval of the authorities having jurisdiction.
- .6 Inform Owner of service encountered which require adjustment, relocation or abandonment and arrange for disconnection and capping of pipes.

Excavation, Trenching & Backfilling

- .7 Remove abandoned utility lines to distance of 2 metres from foundations. Cap or otherwise seal lines at cut-off points. Method of capping of abandoned utility lines to be approved by the Consultant.
- .8 Record locations of maintained, re-routed and abandoned underground utility lines.
- .9 Make good and pay for damage to existing utility lines resulting from Work.

1.4 Protection

- .1 Protection of new and existing element of the site, from freezing shall be allowed for in pricing. Repairs or replacement of materials damaged by frost action – as a result of insufficient protection – shall be paid by the Contractor, at no additional cost to the Owner.
- .2 Protect from damage all established sodding, fencing, trees, utilities, buried service, curbing, sidewalks, roadways, bench marks, reference points and boundary markers on this or the adjoining properties.
- .3 Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damage caused by settlement, lateral movement, undermining, washout and other hazards.
- .4 Take precautions to prevent collapse of excavations by the provision of shoring, cribbing, bracing, or other method.
- .5 Protect the Work of other divisions while undertaking the Work of this Section. Any damage shall be made good to the satisfaction of the Consultant and the Owner at no cost to the Owner.
- .6 Provide and maintain secure barricades and/or guardrails to all open excavations at all times.
- .7 Post and operate warning lights to ensure safety of all persons.
- .8 Carry out best practice measures to minimize dust as a result of this Work.
- .9 Stockpile excavated material where it will not interfere with site operation or drainage.

Excavation, Trenching & Backfilling

1.5 Removal of Water

- .1 Provide and install pumps with adequate suction and discharge lines together with power to operate same to keep excavations free of water at all times. Retain pumping equipment at site and operate same as required by other trades to facilitate their operations. Take all necessary precautions to prevent cave-ins and flow of water into the excavation.
- .2 If required, appropriate permit(s) shall be obtained from the appropriate authority(ies) at no additional cost to the Owner. All supporting documentation required for approval shall also be included at no additional cost.

1.6 Removal Of Snow and Frost

- .1 Ensure that adequate protection against frost is implemented during cold weather conditions. Remove all snow and frost from sub-grades, excavated areas, trenches and backfilled materials.

2 PRODUCTS

2.1 Material – Excavating/Backfilling

- .1 Granular “A”: To meet OPSS 1010.
- .2 Granular “B”: To meet OPSS 1010.
- .3 Clean Sand: Clean, washed, coarse sand free from clay, shale and organic matter.

3 EXECUTION

3.1 Excavation

- .1 Excavate to the extent, elevations and depth required for the completion of the Work.
- .2 Provide excavation as may be required for all trades and refer to appropriate sections or sub-trades for details of requirements.
- .3 Bottoms of excavations shall be dry undisturbed soil, level and free from loose or organic matter. Remove soft, wet or unconsolidated ground, muskeg, quicksand, and organic material encountered in excavating. Fill void with well compacted engineered fill to the approval of the Consultant.

Excavation, Trenching & Backfilling

- .4 If removal of earth causes displacement of adjacent earth, the earth so disturbed shall be removed and replaced with approved concrete or granular fill, at no additional cost to the Owner.
- .5 Keep bottom of excavations clean and clear of loose materials. Keep excavations levelled and stepped at changes of levels except for excavations made for drainage purposes. These shall be sloped as required.
- .6 If the excavations reveal seepage zones, springs or other unexpected sub-surface conditions which may necessitate revisions or additions to any drainage system, inform the Consultant immediately so that remedial action can be taken.

3.2 Trenching

- .1 Where trench excavations are not kept within the design limits of the pipe, the Consultant may order sheathing and shoring, and/or a heavier class of pipe, and/or use of a higher class of bedding at no additional cost to the Owner.
- .2 Grade and shape the pipe trench and the specified bedding to give uniform and even bearing for the length of the pipe. Dig bell holes at each joint. Make corrections in the grade with compacted granular material acceptable to the Consultant, or with fill concrete.
- .3 Where pipe is to be laid in filled ground, construct the fill first, to at least 600 mm above the elevation of the top of the pipes before trenching for the pipes. Place fill in 300 mm lifts and compact to 98 percent Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D1557.
- .4 Remove the sub-grade where it has been adversely changed by construction operations and is not adequate to support the pipe. Replace with compacted bedding material or other acceptable material.
- .5 Trench in existing roadways in a manner to prevent over-break. Saw cut pavement in clean straight lines prior to the start of excavation.
- .6 Remove unsuitable material from trench bottom to extent and depth as directed by the inspection and testing agency.

3.3 Stockpiling

- .1 Stockpile fill materials in designated areas. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill material from freezing or contamination.

Excavation, Trenching & Backfilling

3.4 Backfilling

- .1 Do not commence backfilling until areas of Work to be backfilled have been inspected and approved by the Owner's inspection and testing agency.
- .2 Areas to be backfilled shall be free from debris, snow, ice, water or frozen ground. Backfill material shall not be frozen or contain ice, snow, or debris.
- .3 Prior to placing fill under road sub-grade, compact existing sub-grade to obtain same compaction as specified for fill. Remove "soft" material and fill with approved material.
- .4 Maintain proper moisture content in fill to ensure specified compaction density.
- .5 Backfill trenches from the top of the pipe bedding to the underside of surface restoration with site selected excavated material. Use backfill material free of roots, organic material and stone larger than 100 mm. Place backfill material in lifts not exceeding 150 mm. Compact to 98 percent SPMDD in accordance with ASTM D1557 if the pipe is below sub-grade and to 100 percent SPMDD in accordance with ASTM D1557 if the pipe is within the road sub-grade. Place backfill to 600 mm above top of pipe by hand.
- .6 If the Owner's inspection and testing agency decides that the site selected excavation material either wholly or partially, is not suitable for backfill, provide imported material of a type acceptable to the inspection and testing agency. Compact to 98 percent SPMDD in accordance with ASTM D1557.
- .7 Place and compact fill materials in continuous horizontal layers not exceeding 150mm in loose depth. Use methods that prevent disturbing or damaging of buried services, foundation drainage system and waterproofing. Make good any damage caused by this Section at no cost to the Owner.
- .8 Compact fill to specified compaction density with a heavy vibrating roller. Compact fill where heavy roller equipment cannot approach with mechanical tampers to equivalent density.
- .9 Softened materials. Proof-roll sub-grade to detect soft spots.

3.5 Engineered Fill and Compaction

- .1 The area shall be stripped of all existing topsoil material and the underlying fill materials compacted as recommended in the geotechnical report. All soft spots shall be sub-excavated. The exposed native sub-grade shall be examined by the Owner's inspection and testing agency prior to placement of fill.

Excavation, Trenching & Backfilling

- .2 Backfill material, used as engineered fill, shall consist of inorganic soil with moisture content close to its optimum moisture content (within 3%), as determined by SPMDD. The on-site materials, free of organics and debris and with a natural moisture content which is within 3 percent of the optimum moisture content, may be used as engineered fill.
- .3 The backfill shall be placed in 150 mm lifts, compacted to 98 percent SPMDD in accordance with ASTM D1557. Full time monitoring by the Owner's inspection and testing agency shall be provided to verify the compaction requirements are met.
- .4 The fill shall be placed, such that the specified fill geometry is achieved.
- .5 If the surface of engineered fill will be exposed to frost and the engineered fill material consists of frost susceptible material, the engineered fill shall be completed to at least 0.6 m above the proposed founding level, and another 0.6 m random fill shall be placed. The fill shall not be placed between the period of late November and early April, as it is difficult to ensure that the fill is free of frozen soils. If granular material/recycled concrete is used, the above precautionary measures are not necessary.

3.6 Soil Inspection and Testing

- .1 Testing of material and compaction shall be carried out by inspection and testing agency designated and approved by the Owner.

3.7 Surplus Materials

- .1 Dispose off-site.

3.8 Adjustment

- .1 Correct and make good where settlement has occurred during the warranty period of the Contract.
- .2 Make up settlement of backfilling as soon as possible, so that regular traffic in and around Work shall not be inconvenienced.
- .3 Fill depressions to restore the correct grade after a period adequate to reveal settlement has passed. Assume responsibility for making good any subsequent settlement of such fill. Pay costs involved in making good paving, sodding and all other surfaces damaged by such settlement and subsequent restoration.

END OF SECTION

Rock Removal

1 GENERAL

1.1 Section Includes

- .1 Work required to remove rock from excavation.
- .2 Classification of Rock Excavation.

1.2 Definitions

- .1 Rock: Solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m³.
- .2 Common Excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

1.3 Blasting Operations

- .1 No blasting is permitted.

1.4 Submittals

- .1 Submit for approval written description of the proposed rock removal method, including plans, drawings, diagrams, or other details. Indicate proposed method of carrying out work and sequence of work. Include details on protective measures and other pertinent details. Acceptance of the Contractor's plan shall not relieve the Contractor of responsibility to complete the work as specified.

1.5 Measurement

- .1 Rock excavation shall be measured in cubic metres.
- .2 Volume of rock excavated for trenches is to be determined by the product of the following dimensions measured in place:
 - .1 Height: vertical distance from rock surface to bottom of designed trench.
 - .2 Width: actual width of trench measured horizontally limited to pipe O.D. plus 600 mm or the maximum trench width specified on the Contract Drawings.
 - .3 Length: measured horizontally along the centreline of the trench.

Rock Removal

- .3 The volume of rock excavation for structures is to be determined by product of following dimensions:
 - .1 Height: vertical distance from rock surface to bottom of working slab.
 - .2 Horizontal: dimension of external surface of structure plus 300 mm clearance all around structure.
- .4 Volume of rock excavation for boulders and rock fragments to be determined by product of three maximum rectilinear dimensions.

2 PRODUCTS

- .1 Not Used.

3 EXECUTION

3.1 Rock Removal

- .1 Remove rock to alignments, profiles, and cross sections indicated on the Contract Drawings.
- .2 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak to avoid damage to adjacent structures.
- .3 Scale, pressure wash and broom clean rock surfaces that are to bond to concrete.
- .4 Excavate trenches to lines and grades to a minimum of 150 mm below the pipe invert(s) indicated on the Contract Drawings. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along the barrel of pipe.
- .5 Cut trenches to widths as indicated.
- .6 Remove boulders and fragments that may slide or roll into excavated areas.
- .7 Correct unauthorized rock removal at no extra cost, in accordance with backfilling requirements specified in Section 02315 - Excavating, Trenching and Backfilling.

Rock Removal

3.2 Rock Disposal

- .1 Dispose of surplus removed rock off site.
- .2 Make all necessary arrangements for disposal site.

END OF SECTION

Roadway Excavation, Embankment and Compaction

1 GENERAL

1.1 References

- .1 ASTM D698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard.
- .2 Geotechnical Investigation Reports (to be completed).

1.2 Definitions

- .1 Excavation: excavation of deposits of whatever character encountered in work including rock, boulders and rock fragments.
- .2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .3 Waste material: material unsuitable for use in embankment or surplus to requirements.
- .4 Borrow material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.
- .5 Unsuitable materials:
 - .1 Very weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .4 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	% Passing
2.00mm	100
0.10mm	45-100
0.02mm	10-80
0.005mm	0-45

- .5 Coarse grained soils containing more than 20% by mass passing 0.075mm sieve.

Roadway Excavation, Embankment and Compaction

- .6 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to subgrade elevation.
- .7 Pavement structure: combination of layers of unbound or stabilized granular sub-base, base and asphalt or concrete surfacing.
- .8 Subgrade elevation: elevation immediately below pavement structure.

1.3 Traffic Provisions

- .1 Provide and maintain roadways, walkways and detours for vehicular and pedestrian traffic and access to fire hydrants at all times during construction.

2 PRODUCTS

2.1 Materials

- .1 Embankment materials require approval by the Contract Administrator.
- .2 Material used for embankment shall not contain organic matter, frozen lumps, weeds, sod, roots, logs, stumps or any other unsuitable material.
- .3 Use HL3 and HL8 asphalt materials on roadway areas.
- .4 Water: Potable water from municipal potable water source.

3 EXECUTION

3.1 Compaction Equipment

- .1 Compaction equipment must be capable of obtaining required densities of materials on project.

3.2 Water Distributors

- .1 Apply water with equipment capable of providing uniform distribution.

3.3 Stripping

- .1 Commence topsoil stripping of areas as indicated, or as directed by the Contract Administrator after brush has been removed from these areas.

Roadway Excavation, Embankment and Compaction

- .2 Strip topsoil to depths as indicated or as directed by the Contract Administrator. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as indicated, or as directed by the Contract Administrator. Stockpile height not to exceed 3m.
- .4 Dispose of unused topsoil off site, as required.

3.4 Excavating

- .1 General:
 - .1 Advise the Contract Administrator at least 5 working days in advance of excavation operations for initial cross sections to be taken.
- .2 Unsuitable materials:
 - .1 Notify the Contract Administrator whenever unsuitable materials are encountered in cut sections and remove unsuitable materials to depth and extent as directed by the Contract Administrator.
 - .2 Unsuitable materials excavated under 3.4.2.1 are to be disposed of off site or as agreed to by the Contract Administrator.
- .3 Borrow:
 - .1 Use all available suitable materials removed from cut areas before taking material from borrow areas.
 - .2 Provide additional suitable embankment material from off site as required.
- .4 Blasting:
 - .1 No blasting of rock is permitted.
- .5 Side Ditches:
 - .1 Construct side ditches to depths and widths as indicated or as directed by the Contract Administrator to permit steady flow of surface water.
 - .2 Maintain and keep ditches open and free from debris until final acceptance of work.
 - .3

Roadway Excavation, Embankment and Compaction

3.5 Embankments

- .1 Where indicated, or as directed by the Contract Administrator, scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces. Obtain prior approval from the Engineer of method to be used.
- .2 Break up or scarify existing pavement to subgrade elevation as indicated.
- .3 Do not place material which is frozen nor place material on frozen surfaces.
- .4 Maintain crowned surface during construction to ensure ready runoff of surface water. Do not place material in free standing water.
- .5 With material containing less than 25% by volume of stone or rock fragments larger than 100mm:
 - .1 Place and compact to full width in uniform layers not exceeding 200mm loose thickness. The Engineer may authorize thicker lifts if specified compaction can be achieved.
 - .2 Compact to density of not less than 100% Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D698.
 - .3 Bring moisture content of soil to level required to achieve specified compaction. Add water or aerate as required.
- .6 Place topsoil taken from stockpile or other sources, at locations and to depths as directed by the Engineer. Remove surface stones, roots and other debris and leave surface in uniform condition.

3.6 Subgrade Compaction

- .1 After grading has been completed, scarify and mix subgrade surface to required depth of subgrade compaction.
- .2 Remove unsuitable materials found during work. Replace with material approved by the Engineer.
- .3 Compact top 150mm of subgrade soil to at least 100% SPMDD in accordance with ASTM D698.
- .4 Bring moisture content of soil to level required to achieve specified compaction. Add water or aerate as required.

Roadway Excavation, Embankment and Compaction

3.7 Finishing And Tolerances

- .1 Shape and compact entire roadbed to within 5mm of design elevations but not uniformly high or low.
- .2 Do scarifying, blading, compacting or other methods of work as necessary to provide thoroughly compacted roadbed shaped to grades and cross sections as indicated or as directed by the Engineer.
- .3 Finish back and side slopes of common material to neat condition, suitable for seeding, true to line and grade.
 - .1 Remove isolated boulders exposed in cut slopes and fill resulting cavities.
 - .2 Hand finish slopes that cannot be finished satisfactorily by machine.
- .4 Finish back and side slopes of rock material to neat and safe condition, true to line and grade.

3.8 Protection

- .1 Maintain finished surfaces in condition conforming to this section until acceptance by the Contract Administrator

END OF SECTION

Erosion and Sedimentation Control

1 GENERAL

1.1 Section Includes

- .1 Overview of erosion and sedimentation control requirements and procedures.

1.2 Conformance

- .1 Comply with the Erosion and Sediment Control measures indicated on the Contract Drawings.
- .2 All sediment control measures shall be constructed before any other construction activity and shall remain until construction is complete.
- .3 All erosion and sediment control measures are to be regularly inspected and maintained, as required, to the satisfaction of the Consultant.
- .4 During all construction phases, mud tracking control, consisting of flushing and sweeping roads, shall be provided for all roads.
- .5 Contractor shall ensure that all conditions of the City of Guelph are observed and compliance is maintained at all times.

1.3 References

- .1 U.S. Environmental Protection Agency, Office of Water. "Chapter 3: Sediment and Erosion Control" and Chapter 4: Other Controls". Document No. EPA 832-R-92-005 Storm Water Management for Construction Activities. 1992.

1.4 Objectives

- .1 Prevent the loss of soil from the construction site resulting from storm water runoff, wind erosion, and construction activities.
- .2 Prevent the sedimentation of storm sewers and receiving waters.
- .3 Prevent air pollution caused by dust and particulate matter.

1.5 Description of Work

- .1 Erosion and sedimentation control activities shall include:
 - .1 Implementing erosion and sedimentation control measures shown on the drawings and described in this Section.

Erosion and Sedimentation Control

- .2 Installing erosion and sedimentation control products in accordance with manufacturer instructions and the prescribed installation procedures in the referenced EPA document
- .3 Supervising on site erosion and sedimentation control activities on a daily basis
- .4 Coordinating erosion and sedimentation control tasks with subcontractors to ensure timely and orderly progress of the work
- .5 Conducting erosion and sedimentation control inspections and making necessary repairs
- .6 Maintaining an erosion and sedimentation control inspection log to document observations, deficiencies and corrective actions
- .7 Preparing erosion and sedimentation control documentation and submittals as detailed herein
- .8 Reporting erosion and sedimentation control progress to the Consultant.

1.6 Kick-Off Meeting

- .1 Prior to mobilization on-site, the Contractor shall hold a kick-off meeting to review erosion and sedimentation control requirements. This meeting shall include a review of:
 - .1 Erosion and sedimentation control objectives
 - .2 Erosion and sedimentation control requirements and procedures
 - .3 Erosion and sedimentation control documentation and submittals

1.7 Submittals

- .1 Schedule E1 – ESC Inspection and Photograph Checklist
 - .1 Using the checklist for reference, conduct an inspection of all erosion and sedimentation control measures implemented onsite each week and following any significant storm event (0.5 inches of precipitation or greater).
 - .2 Inspections shall commence when the site is “disturbed” (i.e. when site work begins) and carry through until final landscaping is complete.
 - .3 Provide a minimum of 3 digital photographs of each ESC measure implemented on-site. Record the date each photograph was taken in the checklist. Photographs are required at the following occasions:
 - .1 Immediately following installation,
 - .2 In-situ and,

Erosion and Sedimentation Control

- .3 At the end of construction or prior to removal, whichever comes first
- .4 Submit the completed checklist and accompanying photos to the Consultant after construction and prior to demobilization.
- .2 Schedule E2 – ESC Inspection Log
 - .1 Complete the log on a weekly basis. The log shall commence when the site is “disturbed” (i.e. when site work begins) and carry through until final landscaping is complete.
 - .2 The inspection log shall be completed for each inspection and shall document:
 - .1 Deficiencies related to the measures listed in Schedule E1 – ESC Inspection and Photograph Checklist and,
 - .2 Corrective actions taken to remedy the deficiencies
 - .3 Each deficiency shall be initialed and each log signed after all corrective measures have been completed and documented.
 - .4 Submit an up-to-date copy of the ESC Inspection Log to the Consultant on a monthly basis.
 - .5 Submit a compilation of the completed logs to the Consultant after construction and prior to demobilization.

2 PRODUCTS

2.1 Materials

- .1 Not used.

3 EXECUTION

3.1 Procedures

- .1 Installation
 - .1 Install erosion and sedimentation control products as per this Section and Contract Drawings.
 - .2 Install erosion and sedimentation control products in accordance with manufacturer instructions and the prescribed installation procedures in the referenced EPA document.

Erosion and Sedimentation Control

.2 General Practices

.1 Site Arrangement

- .1 All construction trailers and equipment shall be positioned to reduce the disturbance of the site. They shall be located close to the current phase of construction to minimize traffic damage to the site.

.2 Stabilized Construction Entrance (SCE) (aka Mud Mat)

- .1 Construct a SCE before construction begins at every point where traffic leaves the site and enters onto a public road and/or any unpaved entrance/exit location where there is a risk of transporting mud or sediment onto paved roads.

The SCE shall be at least 3.65m wide, with room for two vehicles to pass at high traffic areas, and constructed of 50mm dia. clear stone, 150mm dia. rip rap, and filter fabric with the following characteristics:

- .1 Grab Tensile Strength: 220lbs
- .2 Elongation Failure: 60%
- .3 Mullen Burst Strength: 430lbs
- .4 Puncture Strength: 125lbs
- .5 Equivalent Opening: Size 40-80 (US std Sieve)

.3 Material Stockpiling

- .1 If material that has been stockpiled and will not be used within 14 days, it shall be stabilized using one of the following measures:
 - .1 Temporary Seeding
 - .2 Tarps
 - .3 Compaction
 - .4 Surface Roughening

.3 Stabilization Practices

.1 Temporary Seeding

- .1 Use temporary seeding to reduce soil erosion by stabilizing areas disturbed by construction that will not be brought to final grade within 30 days.

Erosion and Sedimentation Control

- .2 Areas that may require temporary seeding include, but may not be limited to soil stockpiles, dikes, dams and sides of sediment basins and traps.
- .3 Species used for temporary seeding shall be fast growing, native or adapted, not require permanent irrigation and not be invasive.
- .4 Till/loosen compacted soil prior to planting seed.
- .2 Permanent Seeding
 - .1 Apply permanent seeding to any graded or cleared area.
 - .2 Plant native grass, tree and shrub species in favourable growth conditions. For areas outside of construction activity, plant species within three (3) weeks of construction start.
 - .3 Species shall not require permanent irrigation after the first two years or fertilizers containing phosphorus. Species shall not be invasive.
 - .4 Use topsoil on areas where topsoil has been removed, where the soil is dense or impermeable, or where mulching and fertilizers alone cannot improve soil quality. Make topsoil layers at least 2 inches deep, or similar to the existing topsoil depth.
- .4 Structural Practices
 - .1 Heavy Duty Silt Fence
 - .1 Construct posts with a filter fabric media to remove sediment from storm water volumes flowing through the fence.
 - .2 The lower edge of the fence is to be vertically trenched and covered by backfill.
 - .3 Filter fabric should be a pervious sheet of polypropylene, nylon, polyester, polyethylene, or equivalent and have the following characteristics:
 - .1 Filtering Efficiency: 75%-85% (minimum)
 - .2 Tensile Strength at 20% (maximum) Elongation: Standard Strength = 30 lb/linear in. (min.), Extra Strength = 50 lb/linear in. (min.)
 - .3 Slurry Flow Rate: 0.3 gal/ft²/min (min.)

Erosion and Sedimentation Control

.2 Outlet Protection

- .1 Install stone, riprap, concrete aprons, paved sections, or settling basins at all pipe, interceptor dike, swale, or channel section outlets where the velocity of flow may cause erosion or pools at the outlet of an erosion and sedimentation control measure.

.3 Inlet Protection

- .1 Install straw bales, stone, concrete masonry units and stone, filter fabric, siltsack, or silt fences around catch basins and manhole covers to prevent silting of inlets, storm drainage systems, or receiving channels.

.4 Surface Roughening

- .1 Create horizontal grooves, depressions, or steps that run parallel to the contour of the land.
- .2 Use surface roughening on all slopes, as soon as possible after the vegetation has been removed.
- .3 Methods of surface roughening are stair-step grading, grooving (using disks, spring harrows, or teeth on a front-end loader), and tracking (driving a crawler tractor up and down a slope, leaving the cleat imprints parallel to the slope contour).

3.2 Inspections & Maintenance

- .1 Using Schedule E1 – ESC Inspection and Photograph Checklist for reference, inspect all erosion and sedimentation control measures at least once each week and following any significant storm event (0.5 inches of precipitation or greater).
- .2 All erosion and sedimentation control measures shall be maintained in good working order. If maintenance or repairs are identified they must be completed within 24 hours.
- .3 Schedule E2 – ESC Inspection Log (1.8.2) shall be completed for each inspection.
- .4 Inspection procedures specified below summarize the EPA document and shall be followed in conjunction with details, drawings, and manufacturer requirements.
 - .1 Stabilized Construction Entrance: Apply additional gravel as required, remove sediments and other materials from all areas to minimize clogging. Keep adjacent public roadway(s) free of sediment.
 - .2 Material Stockpile: Inspect for effective prevention of runoff and erosion.

Erosion and Sedimentation Control

- .3 Temporary Seeding: If plants do not grow quickly or thick enough to prevent erosion, reseed the area as soon as possible. Keep seeded areas adequately moist. If irrigation is required, over-watering shall be avoided. Phosphorus-containing fertilizers shall not be used.
- .4 Permanent Seeding: Inspect for sufficient growth and water conditions. Replant areas as per installation instructions (refer to 3.1.3) if cover does not provide erosion control.
- .5 Heavy Duty Silt Fence: Silt fence to be inspected for depth of sediment, tears, loose fabric attachment at the fence posts, channel erosion beneath fence, sagging or collapse and to ensure the fence posts are firmly in the ground. Built up sediment shall be removed from silt fence when it has reached one-third the height of the fence. Repair such that fence is in original installation condition.
- .6 Outlet Protection: Inspect outlet for erosion and pooling of water. Necessary repairs shall made as required to reduce exit velocity of runoff. If a riprap apron is used, inspect for riprap displacement and damage to filter fabric.
- .7 Inlet Protection: Inspect that measures are in original installed condition. Ensure measures are effectively trapping sediment. Remove accumulated sediment and debris when it reaches $\frac{1}{2}$ the design depth of the trap. Repair protection measures as required.
- .8 Surface Roughening: Inspect for small eroded watercourses, as little as a few inches deep, or washout of roughened grading. Fill, regrade, and reseed immediately.

3.3 Removal of Products

- .1 Erosion and sedimentation control measures shall be maintained and inspected until final landscaping is complete.

END OF SECTION

Erosion and Sedimentation Control

SCHEDULE E1 – ESC INSPECTION AND PHOTOGRAPH CHECKLIST

(Submit checklist with photos to Consultant after construction and prior to demobilization)

Project Name:		Completed By:	
Project Location:		Company:	

Conduct an inspection of all erosion and sedimentation control measures implemented onsite each week and following any significant storm event (0.5 inches of precipitation or greater). Record any maintenance or repair performed in Schedule E2 – ESC Inspection Log.

Photographs of each measure must be taken immediately following installation, in-situ and at the end of construction.

ESC Measure	Location Onsite	Date of Photo		
		#1	#2	#3
Stabilized Construction Entrance				
Silt Fence				
Inlet/Outlet Protection				
Material Stockpiling ESC Measures				

I hereby certify that the information provided is complete and correct:

Signature of Authorized Official

Position

Date

Erosion and Sedimentation Control

SCHEDULE E2 – ESC INSPECTION LOG

(Complete weekly. Submit most recent copy to the Consultant on a monthly basis)

Project Name:		Completed By:	
Project Location:		Company:	

Date		Erosion and Sedimentation Control Measures			Initials
		Observations	Deficiencies	Corrective Action Taken	
Ex.	Sept 17/06	Heavy rain night before. Measures in good condition.	Straw bale check dam in northeast swale deteriorated	New straw bale installed in northeast swale.	G.L.

I hereby certify that the information provided
is complete and correct:

Signature of Authorized Official

Position

Date

Micropiles

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- .1 General Conditions and Division 1, General Requirements, shall govern Work of this Section.
- .2 Quantities and dimensions enclosed in brackets apply to Project for which Drawings are in imperial units.

1.2 DESCRIPTION

- .1 Work Installed by this Section but Supplied by Others:
 - .1 Concrete Reinforcement: to supply steel reinforcement Section 03200[03 20 00]
- .2 Related Work Specified in Other Sections:
 - .1 Excavation Section 31 23 10
 - .2 Shoring Section 31 41 00
 - .3 Concrete Formwork Section 03 10 00
 - .4 Concrete Reinforcement Section 03 20 00
 - .5 Cast-In-Place Concrete: Section 03 30 00
 - .6 Geotechnical Report Section 00 30 00
- .3 Co-operation with Work of Other Sections:
 - .1 Check project Drawings and Specifications for requirements of other Sections, which will affect installation of Work of this Section
 - .2 Inform those performing Work of other Sections, in writing or by schedules, of requirements for materials and built-in items supplied by other Sections.
- .4 Co-operation with Consultant:
 - .1 Before commencing Work, review with Consultant, Work performed under this Section.
 - .2 Schedule Work to allow sufficient time and access for Consultant to carry out periodic field review.
- .5 Co-operation with Inspection and Testing Company:
 - .1 Provide free access to Work.
- .6 This work shall consist of constructing micropiles as shown on the contract plans and approved working drawings and as specified herein. The micropile specialty Contractor is responsible for furnishing of all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision, and manufacturing techniques required for design, installation and testing of micropiles and pile top attachments for this project.

Micropiles

- .7 The selected micropile Contractor shall select the micropile type, size, pile top attachment, installation means and methods, estimate the ground-grout bond value and determine the required grout bond length and final micropile diameter. The micropile Contractor shall design and install micropiles that will develop the load capacities indicated on the contract plans. The micropile load capacities shall be verified by verification and proof load testing as required and must meet the test acceptance criteria specified herein.
- .8 Where the imperative mood is used within this specification, "The Contractor shall" is implied.

1.3 MICROPILE CONTRACTOR'S EXPERIENCE REQUIREMENTS AND SUBMITTALS

- .1 The micropile Contractor shall be experienced in the construction and load testing of micropiles and have successfully constructed at least five (5) projects in the last five (5) years involving construction totaling at least 100 micropiles of similar capacity to those required in these plans and specifications.
- .2 The Contractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions. The Contractor shall submit construction details, structural details and load test results for at least three previous successful micropile load tests from different projects of similar scope to this project.
- .3 The Contractor shall assign an Engineer to supervise the work with experience on at least three (3) projects of similar scope to this project completed over the past five (5) years. The Contractor shall not use consultants or manufacturers' representatives to satisfy the supervising Engineer requirements of this section. The on-site foremen and drill rig operators shall also have experience on at least three (3) projects over the past five (5) years installing micropiles of equal or greater capacity than required in these plans and specifications.
- .4 The micropiles shall be designed by a Registered Professional Engineer with experience in the design of at least three (3) successfully completed micropile projects over the past five (5) years, with micropiles of similar capacity to those required in these plans and specifications. The micropile designer may be either an employee of the Contractor or a separate Consultant designer meeting the stated experience requirements.
- .5 At least 45 calendar days before the planned start of micropile construction, the Contractor shall submit the completed project reference list and a personnel list. The project reference list shall include a brief project description with the owner's name and current phone number and load test reports. The personnel list shall identify the micropile system designer (if applicable), supervising project Engineer, drill rig operators, and onsite foremen to be assigned to the project. The personnel list shall contain a summary of each individual's experience and be complete enough for the Consultant to determine whether each individual satisfies the required qualifications. The Consultant will approve or reject the Contractor's qualifications within 15 calendar days after receipt of a complete submission. Additional time required due to incomplete or unacceptable submittals will not be cause for time extension or impact or delay claims. All costs associated with incomplete or unacceptable submittals shall be borne by the Contractor.
- .6 Work shall not be started, nor materials ordered, until the Consultant's written approval of the Contractor's experience qualifications is given. The Consultant may suspend the Work if the Contractor uses non-approved personnel. If work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time will result from the suspension.

Micropiles

1.4 DEFINITIONS

- .1 **Admixture:** Substance added to the grout to control bleed and/or shrinkage, improve flowability, reduce water content, or retard setting time.
- .2 **Alignment Load (AL):** An initial load applied to micropile during testing to keep the testing equipment correctly positioned (Typically 5% maximum test load).
- .3 **Bonded Length:** The length of the micropile that is bonded to the ground and conceptually used to transfer the applied axial loads to the surrounding soil or rock. Also known as the load transfer length.
- .4 **Bond-breaker:** A sleeve placed over the steel reinforcement to prevent load transfer.
- .5 **Casing:** Steel tube introduced during the drilling process in overburden soil to temporarily stabilize the drill hole. This is usually withdrawn as the pile is grouted, although in certain types of micropiles, some casing is permanently left in place to provide added pile reinforcement.
- .6 **Centralizer:** A device to support and position the reinforcing steel in the drill hole and/or casing so that a minimum grout cover is provided.
- .7 **Consultant:** The Owner or Owner's authorized agent.
- .8 **Contractor:** The person/firm responsible for performing the micropile work.
- .9 **Coupler:** The means by which load capacity can be transmitted from one partial length of reinforcement to another.
- .10 **Creep Movement:** The movement that occurs during the creep test of a micropile under a constant load.
- .11 **Design Load (DL):** The maximum ULS factored load expected to be applied to the micropile during its service life.
- .12 **Encapsulation:** A corrugated or deformed tube protecting the reinforcing steel against corrosion.
- .13 **Free (Unbonded) Length:** The designed length of the micropile that is not bonded to the surrounding ground or grout.
- .14 **Geotechnical Bond Design Strength:** For Ultimate Limits States (ULS) or Load Factor Design (LFD), computed as the nominal grout-to-ground bond strength multiplied by a geotechnical resistance factor ϕ_g . Use:
 - .1 $\phi_g = 0.6$ for compression loading
 - .2 $\phi_g = 0.4$ for tension loading
- .15 **Micropile:** A small-diameter, bored, cast-in-place composite pile, in which the applied load is resisted by steel reinforcement, cement grout and frictional grout/ground bond.
- .16 **Maximum Test Load:** The maximum load to which the micropile is subjected during testing
- .17 **Nominal Grout-to-Ground Bond Strength:** The estimated ultimate geotechnical unit grout-to-ground bond strength selected for use in design.

Micropiles

- .18 **Overburden:** Material, natural or placed, that may require cased drilling methods to provide an open borehole to underlying strata.
- .19 **Post-grouting:** The injection of additional grout into the load transfer length of a micropile after the primary grout has set. Also known as regrouting or secondary grouting.
- .20 **Primary Grout:** Portland-cement-based grout injected into the micropile hole prior to or after the installation of the reinforcement to direct the load transfer to the surrounding ground along the micropile.
- .21 **Proof Load Test:** Incremental loading of a production micropile, recording the total movement at each increment.
- .22 **Reinforcement:** The steel component of the micropile that accepts and/or resists applied loadings.
- .23 **Sheathing:** Smooth or corrugated piping or tubing that protects the reinforcing steel against corrosion.
- .24 **Spacer:** A device to separate elements of a multiple-element reinforcement.
- .25 **Ultimate Load (UL):** Micropile load corresponding to the nominal grout-to-ground bond strength for the pile configuration and dimensions.
- .26 **Verification Load Test:** Pile load test performed to verify the design of the pile system and the construction methods proposed, prior to installation of production piles. Test piles are typically constructed to full scale or may be scaled for practical testing purposes.

1.5 REFERENCED CODES AND STANDARDS

- .1 The following publications form a part of this specification to the extent indicated by the references. The latest publication as of the issue date of this specification shall govern, unless indicated otherwise:
- .2 American Society for Testing and Materials (ASTM) & American Association of State Highway and Transportation Officials (AASHTO)
 - .1 ASTM A36, A572, AASHTO M183, M223 - Structural Steel
 - .2 ASTM A1064, AASHTO M55 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - .3 ASTM A252 - Welded and Seamless Steel Pipe Piles
 - .4 ASTM A615, AASHTO M31 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement
 - .5 ASTM A722 - Uncoated High-Strength Steel Bar for Prestressing Concrete
 - .6 ASTM A775 - Epoxy -Coated Reinforcing Steel Bars
 - .7 ASTM A934 - Epoxy-Coated Prefabricated Steel Reinforcing Bars
 - .8 ASTM C33, AASHTO M80 - Concrete Aggregates

Micropiles

- .9 ASTM C109 - Compressive Strength of Hydraulic Cement Mortar
- .10 ASTM C188, AASHTO T133 - Density of Hydraulic Cement
- .11 ASTM C144 - Aggregate for Masonry Mortar
- .12 ASTM C150. AASHTO M85 - Portland Cement
- .13 ASTM C494, AASHTO M194 - Chemical Admixtures for Concrete
- .14 ASTM D1143 - Method of Testing Piles Under Static Axial Compressive Load
- .15 ASTM D1784 - Polyvinyl Chloride (PVC) Pipe (Class 13464-B)
- .16 ASTM D3350, AASHTO M252 - Polyethylene Corrugated Tubing
- .17 ASTM D3689 - Method of Testing Individual Piles Under Static Axial Tensile Load
- .18 ASTM D3966 Standard Test Method for Piles Under Lateral Load
- .19 AASHTO T26 Quality of Water to be Used in Concrete
- .3 Canadian Codes
 - .1 CSA W59-18, "Welded Steel Construction".
 - .2 CSA W186-21, "Welding of Reinforcing Bars in Reinforced Concrete Construction".
 - .3 CSA G40.20-13/G40.21-13(R2018), "General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steels".
 - .4 CSA S16-19, "Design of Steel Structures".
 - .5 CSA W48-18 (R2023), "Filler Metals and Allied Materials for Metal Arc Welding".
 - .6 CSA 47.1-19, "Certification of Companies for Fusion Welding of Steel".
- .4 American Society of Civil Engineers (ASCE):
 - .1 ASCE 20-96 - Standard Guidelines for the Design and Installation of Pile Foundations.
- .5 Deep Foundations Institute (DFI)
 - .1 Guide to Drafting a Specification for High Capacity Drilled and Grouted Micropiles for Structural Support, 1st Edition, Copyright 2001 by the Deep Foundation Institute (DFI).
- .6 U.S. Department of Transportation, Federal Highway Administration (FHWA)
 - .1 FHWA-SA-97-070 - Micropile Design and Construction Guidelines Manual
 - .2 NHI-05-039 - Micropile Design & Construction

Micropiles

1.6 CONSTRUCTION SITE SURVEY

- .1 Before bidding the Work, the Contractor shall review the available subsurface information and visit the site to assess the site geometry, equipment access conditions, and location of existing structures and above ground facilities.
- .2 The Contractor is responsible for field locating and verifying the location of all utilities shown on the plans prior to starting the Work. Maintain uninterrupted service for those utilities designated to remain in service throughout the Work. Notify the Consultant of any utility locations different from shown on the plans that may require micropile relocations or structure design modification.
- .3 Prior to start of any micropile construction activity, the Contractor and Consultant shall jointly inspect the site to observe and document the pre-construction condition of the site, existing structures and facilities.

1.7 MICROPILE DESIGN REQUIREMENTS

- .1 The micropiles shall be designed to meet the specified loading conditions, as shown on the contract plans and approved working drawings. Design the micropiles and pile cap connections using the Service Load Design (SLD) procedures contained in the FHWA "Micropile Design and Construction Guidelines Manual", Report No. FHWA-SA-97-070.
- .2 The required geotechnical resistance factors (for ULS or LFD Design) shall be in accordance with the project specific geotechnical report and the FHWA manual, unless specified otherwise. Estimated soil/rock design shear strength parameters, unit weights, applied foundation loadings, slope and external surcharge loads, corrosion protection requirements, known utility locations, easements, right-of-ways and other applicable design criteria will be as shown on the plans or specified herein.
- .3 Steel pipe used for micropile permanent casing shall incorporate an additional 1.6 mm thickness of sacrificial steel for corrosion protection, unless specified otherwise.
- .4 Where required as shown on the contract plans, corrosion protection of the internal steel reinforcing bars, consisting of either encapsulation, epoxy coating, or grout, shall be provided. Where permanent casing is used for a portion of the micropile, encapsulation shall extend at least 1.5 m into the casing.

1.8 MICROPILE DESIGN SUBMITTALS.

- .1 At least 21 calendar days before the planned start of micropile structure construction, submit complete design calculations and working drawings to the Consultant for review and approval. Include all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropile structure. Verify the limits of the micropile structure and ground survey data before preparing the detailed working drawings.
- .2 The drawings and calculations shall be signed and sealed by the contractor's Professional Engineer, previously approved by the Consultant. If the micropile contractor uses a third party design engineer to prepare the design, the micropile contractor shall still have overall contract responsibility for both the design and the construction.

1.9 DESIGN CALCULATIONS

- .1 Design calculations shall include, but not be limited to, the following items:

Micropiles

- .1 A written summary report which describes the overall micropile design.
- .2 Applicable code requirements and design references.
- .3 Design calculation sheets (both static and seismic) with the project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page.
- .4 Micropile structure critical design cross-section(s) geometry including soil/rock strata and water levels and location, magnitude and direction of design applied loadings, including slope or external surcharge loads.
- .5 Design criteria including, soil/rock shear strengths (friction angle and cohesion), unit weights, and ground-grout bond values and micropile drill-hole diameter assumptions for each soil/rock strata.
- .6 Load and resistance factors used in the design on the ground-grout bond values, surcharges, soil/rock and material unit weights, steel, grout, and concrete materials.
- .7 Seismic design earthquake acceleration coefficient.
- .8 Design notes including an explanation of any symbols and computer programs used in the design.
- .9 Pile to footing connection calculations.

1.10 WORKING DRAWINGS

- .1 The working drawings shall include all information required for the construction and quality control of the piling. Working drawings shall include, but not be limited to, the following items unless provided in the contract plans:
 - .1 A plan view of the micropile structure(s) identifying:
 - .1 A reference baseline and elevation datum.
 - .2 The offset from the construction centerline or baseline to the face of the micropile structure at all changes in horizontal alignment.
 - .3 Beginning and end of micropile structure stations.
 - .4 Right-of-way and permanent or temporary construction easement limits, location of all known active and abandoned existing utilities, adjacent structures or other potential interferences. The centerline of any drainage structure or drainage pipe behind, passing through, or passing under the micropile structure.
 - .5 Subsurface exploration locations shown on a plan view of the proposed micropile structure alignment with appropriate reference base lines to fix the locations of the explorations relative to the micropile structure.
 - .2 An elevation view of the micropile structure(s) identifying:

Micropiles

- .1 Elevation view showing micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable).
- .2 Existing and finish grade profiles both behind and in front of the micropile structure.
- .3 Design parameters and applicable codes.
- .4 General notes for constructing the micropile structure including construction sequencing or other special construction requirements.
- .5 Horizontal and vertical curve data affecting the micropile structure and micropile structure control points. Match lines or other details to relate micropile structure stationing to centerline stationing.
- .6 A listing of the summary of quantities on the elevation drawing of each micropile structure showing pay item estimated quantities (if applicable).
- .7 Micropile typical sections including micropile spacing and inclination; minimum drillhole diameter; pipe casing and reinforcing bar sizes and details; splice types and locations; centralizers and spacers; grout bond zone and casing plunge lengths (if used); corrosion protection details; and connection details to the substructure footing, anchorage, plates, etc.
- .8 A typical detail of verification and production proof test micropiles defining the micropile length, minimum drillhole diameter, inclination, and load test bonded and unbonded test lengths (if applicable).
- .9 Details, dimensions, and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details.
- .10 Revise the drawings when plan dimensions are changed due to field conditions or for other reasons. Within 30 days after completion of the work, submit as-built drawings to the Consultant. Provide revised design calculations signed by the approved Registered Professional Engineer for all design changes made during the construction of the micropile structure.

1.11 CONSTRUCTION SUBMITTALS

- .1 Work other than test pile installation shall not begin until the construction submittals have been received, reviewed, and accepted in writing by the Consultant. Provide work plan, schedule, welding procedure, headroom requirements and surface water control plan at least 21 calendar days prior to initiating micropile construction.
- .2 Provide mill reports as the work progresses for each delivery.
- .3 Provide grout plan and load test plan at least seven days prior to start of micropile load testing or incorporation of the respective materials into the work.
- .4 Work Plan: Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to assure quality control. This step-by-step procedure shall be shown on the working drawings in sufficient detail to allow the Consultant to monitor the construction and quality of the micropiles.

Micropiles

- .5 Schedule: Proposed start date and time schedule and micropile installation schedule providing the following:
 - .1 Micropile number
 - .2 Micropile design load
 - .3 Type and size of reinforcing steel
 - .4 Minimum total bond length
 - .5 Total micropile length
 - .6 Micropile top footing attachment
- .6 Welding procedure: If welding of casing is proposed, submit the proposed welding procedure, certified by a qualified welding specialist.
- .7 Information on headroom and space requirements for installation equipment that verify the proposed equipment can perform at the site.
- .8 Surface Water Control Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.
- .9 Certified mill test reports for the reinforcing steel or coupon test results for permanent casing without mill certification. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.
- .10 Proposed Grouting Plan. The grouting plan shall include complete descriptions, details, and supporting calculations for the following:
 - .1 Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports.
 - .2 Methods and equipment for accurately monitoring and recording the grout depth, grout volume and grout pressure as the grout is being placed.
 - .3 Grouting rate calculations, when requested by the Consultant. The calculations shall be based on the initial pump pressures or static head on the grout and losses throughout the placing system, including anticipated head of drilling fluid (if applicable) to be displaced.
 - .4 Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be submitted for initial verification and acceptance and start of production work. During production, grout shall be tested in accord with PART 3.
 - .5 Procedure and equipment for Contractor monitoring of grout quality.
- .11 Load Testing Plan: Detailed plans for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with Section 3.12, Pile Load Tests.

Micropiles

- .12 Calibration reports and data for each test jack, pressure gauge and master pressure gauge and electronic load cell to be used. The calibration tests shall have been performed by an independent testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge and electronic load cell calibration data.

1.12 PRE-CONSTRUCTION MEETING

- .1 A pre-construction meeting will be scheduled by the Contractor and held prior to the start of micropile construction. The Consultant, prime Contractor, micropile specialty Contractor, micropile designer, excavation Contractor and geotechnical instrumentation specialist (if applicable) shall attend the meeting. Attendance is mandatory. The pre-construction meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction schedule and activities, and to identify contractual relationships and delineation of responsibilities amongst the prime Contractor and the various Subcontractors – specifically those pertaining to excavation for micropile structures, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control and site drainage control.

PART 2 - MATERIALS

- .1 Furnish materials new and without defects. Remove defective materials from the jobsite at no additional cost. Materials for micropiles shall consist of the following:
- .1 **Admixtures for Grout:** Admixtures shall conform to the requirements of ASTM C494/AASHTO M194. Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to the review and acceptance of the Engineer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations and anchorage covers. Accelerators are not permitted. Admixtures containing chlorides are not permitted.
 - .2 **Cement:** All cement shall be Portland cement conforming to ASTM C ISO/AASHTO M85, Types II, III or V.
 - .3 **Centralizers and Spacers:** Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used. Centralizers and spacers shall be securely attached to the reinforcement; sized to position the reinforcement within 10 mm of plan location from center of pile; sized to allow grout tremie pipe insertion to the bottom of the drillhole; and sized to allow grout to freely flow up the drillhole and casing and between adjacent reinforcing bars.
 - .4 **Encapsulation:** Encapsulation (double corrosion protection) shall be shop fabricated using high-density, corrugated polyethylene tubing conforming to the requirements of ASTM D3350/AASHTO M252 with a nominal wall thickness of 0.8 mm. The inside annulus between the reinforcing bars and the encapsulating tube shall be a minimum of 5 mm and be fully grouted with non-shrink grout conforming to PART 2.
 - .5 **Epoxy Coating:** The minimum thickness of coating applied electrostatically to the reinforcing steel shall be 0.3 mm. Epoxy coating shall be in accordance with ASTM A775 or ASTM A934. Bend test requirements are waived. Bearing plates and nuts encased in the pile concrete footing need not be epoxy coated.

Micropiles

- .6 **Fine Aggregate:** If sand - cement grout is used, sand shall conform to ASTM C 144/AASHTO M45.
- .7 **Grout:** Neat cement or sand/cement mixture with a minimum three (3)-day compressive strength of 14 MPa and a 28day compressive strength of 28 MPa per AASHTO T106/ASTM C109.
- .8 **Grout Protection:** Provide a minimum 25 mm grout cover over bare or epoxy coated bars (excluding bar couplers) or minimum 12 mm grout cover over the encapsulation of encapsulated bars.
- .9 **Permanent Casing Pipe:** Permanent steel casing/pipe shall have the diameter and at least minimum wall thickness shown on the approved Working Drawings. The permanent steel casing/pipe:
 - .1 Shall meet the Tensile Requirements of ASTM A252, Grade 3, except the yield strength shall be a minimum of 345 MPa to 552 MPa as used in the design submittal.
 - .2 May be new "Structural Grade" (a.k.a. "Mill Secondary") steel pipe meeting above but without Mill Certification, free from defects (dents, cracks, tears) and with two (2) coupon tests per truckload delivered to the fabricator.
- .10 For permanent casing/pipe that will be welded, the following material conditions apply:
 - .1 The carbon equivalency (CE) as defined in AWS D1.1, Section X15.1, shall not exceed 0.45, as demonstrated by mill certifications
 - .2 The sulfur content shall not exceed 0.05%, as demonstrated by mill certifications
- .11 For permanent casing/pipe that will be shop or field welded, the following fabrication or construction conditions apply:
 - .1 The steel pipe shall not be joined by welded lap splicing
 - .2 Welded seams and splices shall be complete penetration welds
 - .3 Partial penetration welds may be restored in conformance with AWS D1.1
 - .4 The proposed welding procedure certified by a welding specialist shall be submitted for approval
- .12 Threaded casing joints shall develop at least the required nominal resistance used in the design of the micropile.
- .13 **Plates and Shapes:** Structural steel plates and shapes for pile top attachments shall conform to CSA G40.21 Grade 350.
- .14 **Reinforcing Bars:** Reinforcing steel shall be deformed bars in accordance with ASTM A615/AASHTO M31, Grade 420 or Grade 520 or ASTM A722/AASHTO M275, Grade 1035. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to footing anchorage, the threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous threadbars) or may be cut into a reinforcing bar. If threads are cut into a

Micropiles

reinforcing bar, the next larger bar number designation from that shown on the Plans shall be provided, at no additional cost. All bars to be double corrosion protected.

- .15 Bar tendon couplers, if required, shall develop the ultimate tensile strength of the bars without evidence of any failure.
- .16 Sheathing: Smooth or corrugated plastic sheathing, including joints, shall be watertight. Polyvinyl chloride (PVC) sheathing shall conform to ASTM D1784, Class 13464-B.
- .17 Water: Water used in the grout mix shall conform to AASHTO T26 and shall be potable, clean, and free from substances that may be injurious to cement and steel.

PART 3 - EXECUTION

- .1 Site drainage control.
 - .1 The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accord with the standard specifications and all applicable local codes and regulations. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost. Upon substantial completion of the Work, remove surface water control pipes or conduits from the site. Alternatively, with the approval of the Consultant, pipes or conduits that are left in place may be fully grouted and abandoned or left in a way that protects the structure and all adjacent facilities from migration of fines through the pipe or conduit and potential ground loss.
- .2 Excavation
 - .1 Coordinate the work and the excavation so the micropile structures are safely constructed. Perform the micropile construction and related excavation in accordance with the Plans and approved submittals. No excavations steeper than those specified herein or shown on the Plans will be made above or below the micropile structure locations without written approval of the Engineer.
 - .2 Immediately contact the Consultant if unanticipated existing subsurface structures are discovered during excavation or drilling. Suspend work in these areas until remedial measures meeting the Consultant's approval are implemented.
- .3 Micropile Allowable Construction Tolerances
 - .1 Centerline of piling shall not be more than 75 mm from indicated plan location.
 - .2 Pile shall be plumb within 2% of total-length plan alignment.
 - .3 Top elevation of pile shall be plus 25 mm or minus 50 mm maximum from vertical elevation indicated.
 - .4 Centerline of reinforcing steel shall not be more than 15 mm from indicated location.
- .4 Micropile Installation
 - .1 The micropile Contractor shall select the drilling method, the grouting procedure and the grouting pressure used for the installation of the micropiles. The micropile Contractor

Micropiles

shall also determine the micropile casing size, final drillhole diameter and bond length, and central tendon reinforcement steel sizing necessary to develop the specified load capacities and load testing requirements. The micropile Contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.

.2 **Drilling**

- .1 The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to any overlying or adjacent structures or services. The drillhole must be open along its full length to at least the design minimum drillhole diameter prior to placing grout and reinforcement.
- .2 Temporary casing or other approved method of anchor drillhole support will be required in caving or unstable ground to permit the anchor shaft to be formed to the minimum design drillhole diameter. The Contractor's proposed method(s) to provide drillhole support and to prevent detrimental ground movements shall be reviewed by the Consultant. Detrimental ground movement is defined as movement which requires remedial repair measures. Use of drilling fluid containing bentonite is not allowed.

.3 **Ground Heave or Subsidence**

- .1 During construction, the Contractor shall observe the conditions vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Consultant if signs of movements are observed. Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Consultant determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs. When due to the Contractor's methods or operations or failure to follow the specified/approved construction sequence, as determined by the Consultant, the costs of providing corrective actions will be borne by the Contractor. When due to differing site conditions, as determined by the Consultant, the costs of providing corrective actions will be paid as Extra Work.

.4 **Pipe Casing and Reinforcing Bars Placement and Splicing**

- .1 Reinforcement may be placed either prior to grouting or placed into the grout - filled drillhole before temporary casing (if used) is withdrawn. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease or oil that might contaminate the grout or coat the reinforcement and impair bond. Pile cages and reinforcement groups, if used, shall be sufficiently robust to withstand the installation and grouting process and the withdrawal of the drill casings without damage or disturbance.
- .2 The Contractor shall check pile top elevations and adjust all installed micropiles to the planned elevations.
- .3 Centralizers and spacers (if used) shall be provided at 3 m centers maximum spacing. The upper and lower most centralizer shall be located a maximum of 1.5

Micropiles

m from the top and bottom of the micropile. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The central reinforcement bars with centralizers shall be lowered into the stabilized drillhole and set. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. Contractor shall redrill and reinsert reinforcing steel when necessary to facilitate insertion.

- .4 Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Splices and threaded joints shall meet the requirements of PART 2. Threaded pipe casing joints shall be located at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 0.3 meters.
- .5 Grouting
 - .1 Micropiles shall be primary grouted the same day the load transfer bond length is drilled. The Contractor shall use a stable neat cement grout or a sand cement grout with a minimum 28-day unconfined compressive strength of 28 MPa. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations. The grouting equipment used shall produce a grout free of lumps and undispersed cement. The Contractor shall have means and methods of measuring the grout quantity and pumping pressure during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressures. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauges shall be capable of measuring pressures of at least 1 MPa or twice the actual grout pressures used, whichever is greater. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow-stem augers, or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drillhole. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.
 - .2 The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow-stem augers, or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to the ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drillhole. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

Micropiles

- .3 Grout within the micropiles shall be allowed to attain the required design strength prior to being loaded.
- .4 If the Contractor elects to use a postgrouting system, Working Drawings and details shall be submitted to the Consultant for review.
- .6 Grout Testing
 - .1 Grout within the micropile verification and proof test piles shall attain the minimum required three (3)-day compressive strength of 14 MPa prior to load testing. Previous test results for the proposed grout mix completed within one year of the start of work may be submitted for initial verification of the required compressive strengths for installation of pre-production verification test piles and initial production piles. During production, micropile grout shall be tested by the Contractor for compressive strength in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one set of three 50-mm grout cubes from each grout plant each day of operation or per every 10 piles, whichever occurs more frequently. The compressive strength shall be the average of the 3 cubes tested.
 - .2 Grout consistency as measured by grout density shall be determined by the Contractor per ASTM C188/AASHTO T133 or API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout. The measured grout density shall be as indicated on working drawings provided by the Contractor.
 - .3 Grout samples shall be taken directly from the grout plant. Provide grout cube compressive strength and grout density test results to the Consultant within 24 hours of testing.
- .7 Micropile Installation Records
 - .1 Contractor shall prepare and submit to the Consultant full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on the micropile installation log included at the end of this specification. A separate log shall be provided for each micropile.
- .5 Pile Load Tests
 - .1 Perform verification and proof testing of piles at the locations specified herein or designated by the Consultant. Perform compression load testing in accord with ASTM D1143 and tension load testing in accord with ASTM D3689, except as modified herein.
 - .2 The maximum verification and proof test loads applied to the micropile shall not exceed 80% of the structural capacity of the micropile structural elements, to include steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. Any required increase in strength of the verification test pile elements above the strength required for the production piles shall be provided for in the contractor's bid price.
 - .3 The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required. When both compression and tension

Micropiles

load testing is to be performed on the same pile, the pile shall be tested under compression loads prior to testing under tension loads.

- .4 For convenience of testing and set-up, pile testing may be performed in tension, regardless of the governing load, with reference to the maximum governing load, unless specified otherwise.
- .5 Testing Equipment and Data Recording
 - .1 Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and a reaction frame. The load cell is required only for the creep test portion of the verification test. The contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves in accordance with the Submittals Section.
 - .2 Design the testing reaction frame to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Align the jack, bearing plates, and stressing anchorage such that unloading and repositioning of the equipment will not be required during the test.
 - .3 Apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 500kPa increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Jack ram travel shall be sufficient to allow the test to be done without resetting the equipment. Monitor the creep test load hold during verification tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test.
 - .4 Measure the pile top movement with a dial gauge capable of measuring to 0.025 mm. The dial gauge shall have a travel sufficient to allow the test to be done without having to reset the gauge. Visually align the gauge to be parallel with the axis of the micropile and support the gauge independently from the jack, pile or reaction frame. Use a minimum of two dial gauges when the test setup requires reaction against the ground or single reaction piles on each side of the test pile.
 - .5 The required load test data shall be recorded by the Engineer.
- .6 Verification Load Tests
 - .1 Perform pre-production verification pile load testing to verify the design of the pile system and the construction methods proposed prior to installing any production piles.
 - .2 Verification load tests shall be performed to verify that the Contractor installed micropiles will meet the required tension load capacities and load test acceptance criteria and to verify that the length of the micropile load transfer bond zone is adequate. The micropile verification load test results must verify the Contractor's design and installation methods, and be reviewed and accepted by the Consultant prior to beginning installation of production micropiles. Installation of production piles should not proceed until all verification test results have been reviewed and accepted by the Consultant.

Micropiles

- .3 Piles used for pre-production testing should not remain in place for usage as production piles unless reviewed and accepted by the Consultant. Test piles to be removed or cut-off and abandoned following completion of testing.
- .4 Verification Test Pile Configuration and Construction
 - .1 The drilling-and-grouting method, casing size, and drill size for the verification test pile(s) shall be identical to those specified for the production piles at the given locations. The verification test micropile structural steel sections shall be sized to safely resist the maximum test load.
 - .2 Test verification piles can be full-scale (same configuration and dimensions as production piles) or they may be scaled to allowable practical limitations of testing equipment and materials, at the sole discretion of the Consultant.
 - .3 Where verification test piles are scaled:
 - .1 Effective bond length shall be no less than 50% of the production pile bond and a minimum of 1.5m.
 - .2 Maximum test load for verification testing shall be scaled to test for the corresponding nominal grout-to-ground bond strength
- .5 Verification Test Quantities and Location
 - .1 Two (2) sacrificial verification test piles shall be constructed in conformance with the approved Working Drawings.
 - .2 Verification test pile(s) shall be installed at the locations proposed by the Contractor and approved by the Consultant. Test piles are to be located such that their installation and performance is representative of production piles, and in locations that will not interfere with production pile installation.
- .6 Verification Test Loading Schedule
 - .1 Test verification piles to a maximum test load corresponding to the nominal grout-to-ground bond strength based on the test pile configuration (full-scale or scaled) or Ultimate Load (UL).

LOAD	HOLD TIME
AL	1 min
0.10UL	1 min
0.15UL	1 min
0.20UL	1 min
0.25UL	1 min

Micropiles

0.30UL	1 min
0.35UL	1 min
0.40UL	1 min
0.45UL	1 min
0.50UL	1 min
0.55UL	1 min
0.60UL	1 min
0.65UL	1 min
0.70UL	1 min
0.75UL	1 min
0.80UL	1 min
0.85UL	1 min
0.90UL	1 min
0.95UL	1 min
1.00UL	CREEP TEST (10min to 60min)
0.80UL	1 min
0.60UL	1 min
0.40UL	1 min
0.20UL	1 min
AL	1min

- .2 The verification pile load tests shall be made by incrementally loading the micropile in accordance with the load schedule for the governing load(s):
- .3 The alignment load (AL) shall not exceed 5% of the UL. Dial gauges shall be reset to zero after the initial AL is applied.
- .4 The test load shall be applied in increments of 10 percent of the UL. Each load increment shall be held for a minimum of 1 minute. Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. Unloading shall be applied in decrements of 20% of the UL.
- .5 The verification test pile shall be monitored for creep at the maximum test load (1.00UL): hold the pile load for 10min and record displacement at 0, 1, 2, 3, 4, 6, 10 minutes. If net creep from 1 to 10 minutes exceeds 1.0mm, hold for additional 50min with displacement readings at 20, 30, 50, and 60 minutes
- .7 The acceptance criteria for micropile verification load tests are:
 - .1 At the end of the creep test at the maximum test load, test piles shall have a creep rate not exceeding 2.0mm/log cycle time. The creep rate shall be linear or decreasing throughout the creep load hold period.

Micropiles

- .2 Failure does not occur at the maximum test load. Failure is defined as load at which attempts to further increase the test load simply result in continued pile movement.
- .3 The Consultant will provide the Contractor written confirmation of the micropile design and construction within seven (7) working days of the completion of the verification load tests. This written confirmation will either confirm the capacities and bond lengths specified in the Working Drawings for micropiles or reject the piles based upon the verification test results.
- .8 Verification Test Pile Rejection
 - .1 If a verification tested micropile fails to meet the acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include modifying the installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure shall require the Consultant's prior review and acceptance. Any modifications of design or construction procedures or cost of additional verification test piles and load testing shall be at the Contractor's expense. At the completion of verification testing, test piles shall be removed down to the elevation specified by the Consultant.

END OF SECTION

Granular Base

1 GENERAL

1.1 References

- .1 ASTM C 117-[90], Test Method for Material Finer Than 0.075mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 131-[89], Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C 136-[92], Method for Sieve Analysis for Fine and Coarse Aggregates.
- .4 ASTM D 698-[91], Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)(2,700 kN-m/m³).
- .5 ASTM D 1557-[91], Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)(2,700 kN-m/m³).
- .6 ASTM D 1883-[92], Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .7 ASTM D 4318-[84], Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .8 CAN/CGSB-8.1-[88], Sieves Testing, Woven Wire, Inch Series.
- .9 CAN/CGSB-8.2-[M88], Sieves Testing, Woven Wire, Metric.
- .10 Geotechnical Investigations (to be completed).

1.2 Delivery, Storage and Handling

- .1 Delivery and stockpile aggregates in accordance with Section 31 05 16 – Aggregates: General. Stockpile minimum 50% of total aggregate required prior to commencing operation.
- .2 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

Granular Base

2 PRODUCTS

2.1 Materials

- .1 Granular base: material to Section 31 05 16 – Aggregates: General and following requirements:
 - .1 Gradations to be within limits specified when tested to ASTM C1 136 and ASTM 117. Sieve sizes to CAN/CGSB-8.1.
- .2 Other Properties as follows:
 - .1 Liquid limit: to ASTM D 4318, maximum 25
 - .2 Plasticity index: to ASTM D 4318, maximum 6
 - .3 Los Angeles degradation: to ASTM C 131. Max % loss by weight: [45].
 - .4 Crushed particles: at least 60% of particles by mass within each of the following sieve designation ranges to have at least one freshly fractured face. Material to be divided into ranges using methods of ASTM C 136.
- .3 Soaked CBR: to ASTM D 1883, min [80] [100], when compacted to 100% of ASTM D 1557.

3 EXECUTION

3.1 Sequence Of Operation

- .1 Place granular base after the sub-base surface is inspected and approved by the Consultant.
- .2 Placing
 - .1 Construct granular base to depth and grade in areas indicated.
 - .2 Ensure no frozen material is placed.
 - .3 Place material only on clean unfrozen surface, free from snow and ice.
 - .4 Place material using methods which do not lead to segregation of degradation of aggregates.
 - .5 Place material to full width in uniform layers not exceeding 150mm compacted thickness.
 - .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .7 Remove and replace that portion of layer in which material becomes segregated or unsuitable during spreading.

Granular Base

- .3 Compaction Equipment
 - .1 Compaction equipment to be capable of obtaining required material densities.
- .4 Compacting
 - .1 Compact to density not less than 98% Standard Proctor Maximum Dry Density in accordance with ASTM D 1557.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Consultant.
 - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Proof Rolling
 - .1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 KPa. Four tires arranged abreast with centre to centre spacing of 730mm.
 - .2 Obtain approval from the Consultant to use non standard proof rolling equipment.
 - .3 Proof roll at level in granular base as indicated. If use of non standard proof rolling equipment is approved, the Engineer is to determine level of proof rolling.
 - .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
 - .5 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove base, sub-base and subgrade material to depth and extent as directed by the Geotechnical Engineer.
 - .2 Backfill excavated subgrade with approved common material and compact in accordance with Section 32 11 24 – Granular Sub-Base.
 - .3 Replace sub-base material and compact in accordance with Section 32 11 24 - Granular Sub-base.
 - .4 Replace base material and compact in accordance with this section.
 - .5 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by the Consultant and replace with new materials in accordance with Section 32 11 24 - Granular Sub-Base and this section at no extra cost.

Granular Base

3.2 Site Tolerances

- .1 Finished base surface to be within plus or minus 5mm of established grade and cross section but not uniformly high or low.

3.3 Protection

- .1 Maintain finished base in condition conforming to this section until succeeding material is applied or until acceptance by the Consultant.

END OF SECTION

Granular Sub-Base

1 GENERAL

1.1 References

- .1 ASTM C117-[90], Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 131-[89], Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C 136-[92], Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D 422-[63 (1990)], Method for Particle-Size Analysis of Soils.
- .5 ASTM D 698-[91], Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
- .6 ASTM D 1557-[91], Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
- .7 ASTM D 1883-[92], Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
- .8 ASTM D 4318-[84], Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .9 CAN/CGSB-8.1-[88], Sieves Testing, Woven Wire, Inch Series.
- .10 CAN/CGSB-8.2-[M88], Sieves Testing, Woven Wire, Metric.
- .11 Geotechnical Investigations by Jacobs Engineering / Stantec Consulting Ltd.

2 PRODUCTS

2.1 Materials

- .1 Granular sub-base material to Section 31 05 16 – Aggregates: General and following requirements:
 - .1 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.
- .2 Other Properties as follows:
 - .1 Liquid Limit: to ASTM D 4318, Maximum 25.
 - .2 Plasticity Index: to ASTM D 4318, Maximum 6.
 - .3 Los Angeles degradation: to ASTM C 131. Max % Loss by mass: 40

Granular Sub-Base

3 EXECUTION

3.1 Placing

- .1 Place granular sub-base after sub-grade is inspected and approved by the Consultant.
- .2 Construct granular sub-base to depths and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .7 Place material to full width in uniform layers not exceeding 150mm compacted thickness.
- .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .9 Remove and replace portion of layer in which material has become segregated or unsuitable during spreading.

3.2 Compaction

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density of not less than 98% Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D1557.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by the Consultant.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

Granular Sub-Base

3.3 Proof Rolling

- .1 Proof rolling shall be used in pavement areas.
- .2 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 KPa. Four tires arranged abreast with centre to centre spacing of 730mm maximum.
- .3 Obtain approval from the Consultant to use non standard proof rolling equipment.
- .4 Proof roll at level in sub-base as indicated. If non standard proof rolling equipment is approved, the Consultant is to determine level of proof rolling.
- .5 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .6 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove sub-base and subgrade material to depth and extent as directed by the Consultant.
 - .2 Backfill excavated subgrade with approved common material and compact in accordance with this section.
- .7 If proofrolling is carried out on the granular sub-base, if it reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.4 Site Tolerances

- .1 Finished sub-base surface to be within 5mm of elevation as indicated but not uniformly high or low.

3.5 Protection

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until the granular sub-base is accepted by the Consultant.

END OF SECTION

Asphalt Paving

1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C 88- [90], Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C 117- [95], Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C 123- [94], Test Method for Lightweight Pieces in Aggregate.
 - .4 ASTM C 127- [88(1993)], Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .5 ASTM C 128- [93], Test Method for Specific Gravity and Absorption of Fine Aggregate.
 - .6 ASTM C 131- [89], Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C 136- [95a], Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM D 698- [91], Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft) (600 kN-m/m).
 - .9 ASTM D 995- [95b], Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
 - .10 ASTM D 1559- [89], Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
 - .11 ASTM D 2419- [95], Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - .12 ASTM D 3203- [94], Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.
 - .13 ASTM D 4318- [95], Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
 - .14 ASTM D 4791- [95], Test Method for Flat or Elongated Particles in Coarse Aggregate.
 - .15 Geotechnical Investigations (to be completed).

Asphalt Paving

- .2 Asphalt Institute (AI).
 - .1 Asphalt Institute MS-2- [1993] [Sixth Edition], Mix Design Method for Asphalt Concrete.
- .3 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-8.1- [88], Sieves Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2- [M88], Sieves Testing, Woven Wire, Metric.
 - .3 CAN/CGSB-16.1- [M89], Cutback Asphalts for Road Purposes.
 - .4 CAN/CGSB-16.2- [M89], Emulsified Asphalts, Anionic Type, for Road Purposes.
 - .5 CAN/CGSB-16.3- [M90], Asphalt Cements for Road Purposes.
- .4 Ontario Provincial Standard Specification (OPSS)
 - .1 OPSS 310, Construction Specification for Hot Mix Asphalt
 - .2 OPSS 1150, Material Specification for Hot Mix Asphalt

1.2 Quality Assurance

- .1 All work under this Section shall be done by a bonafide road building contractor engaged in paving work for at least five years and having the equipment necessary to carry out the work as specified.
- .2 Comply with requirements of Ontario Provincial Standard Specifications (OPSS) 310 and 1150.

1.3 Quality Control

- .1 Comply with requirements of Section 01 45 00.
- .2 Testing agency may do any or all of the following as directed by the Contract Administrator.
 - .1 Carry out grain size analysis.
 - .2 Determine minimum and maximum moisture content of densities of granular fill.
 - .3 Determine in-situ density, thickness and moisture content of compacted fills.

Asphalt Paving

- .4 Check properties of asphalt mixes, including aggregate gradation of asphalt content.
- .5 Check suitability of equipment used.

1.4 Product Data

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit asphalt concrete mix design to Contract Administrator for review.
- .3 Materials to be tested by testing laboratory approved by Contract Administrator.
- .4 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.

1.5 Submittals

- .1 Prior to delivery of materials to site submit gradation tables and, upon Contract Administrator's request, representative samples of base course materials to be used.

1.6 Job Conditions

- .1 Environmental Conditions
 - .1 Lay granular base courses and asphalt paving courses when weather is dry and only on dry granular base.
 - .2 Place granular base course only when ambient temperature is above 0°C. Do not place granular materials while either material being placed or subgrade is frozen.
 - .3 Place asphalt binder course only when the air temperature at the road surface is a minimum of 2°C and rising.

Place asphalt surface course only when the air temperature at the road surface is at least 7°C, except for SMA and Superpave 12.5 FC2 where the air temperature at the road surface is at least 12°C.

Asphalt Paving

.2 Protection

- .1 Make special provisions to minimize deterioration of subgrade, particularly when operating during unfavourable weather conditions or when working in wet granular. Use special designated traffic lanes, build temporary roads, reduce traffic to half-loads or take other suitable measures.
- .2 Do not permit vehicular traffic on finished asphalt pavement until it has cooled and hardened and in no case, sooner than six hours after completion.

Provide barricades and warning devices to protect pavement.

1.7 Warranty

- .1 At no cost to Owner, remedy any defects in work, including work of this and other Sections, due to faults in materials or workmanship provided under this Section of Specifications appearing within a period of two years from date of Substantial Performance.

2 PRODUCTS

2.1 Materials

.1 Base Materials:

- .1 Clean, hard, durable aggregate free of shale, clay, organic matter and other deleterious substances.
- .2 Granular Base: Granular `A` OPSS.MUNI 1010
- .3 Granular Sub-Base: Granular `B`, OPSS.MUNI 1010

.2 Asphalt:

- .1 Hot mixed, hot laid asphalt meeting requirements of OPSS 1150, designation HL8, HL3 or HL4.
- .2 Tack coat: OPSS 1103, Grade SS-1.
- .3 Paint for pavement markings: CGSB 1-GP-74M, White or Yellow as directed by the Contract Administrator.

Asphalt Paving

3 EXECUTION

3.1 Lines And Levels

- .1 Establish and maintain line and grade stakes for duration of work.
- .2 Conform to contours and grades shown. Uniformly slope grade between elevations shown.
- .3 Slope paving away from building minimum 1%. Slope paving minimum 1% for drainage in all locations unless specifically indicated otherwise on Drawings.

3.2 Preparation Of Subgrade

- .1 Examine rough graded subgrade over which asphalt pavement structure is to be installed to ensure it is suitable for installation. Start of work shall imply acceptance of conditions.
- .2 Fine grade subgrade as required to bring it to required levels and slopes. Meet compaction densities and fill material requirements specified in Section 31 11 24 and 31 11 23. Slope fine graded subgrade to permit drainage to catch basins.
- .3 Proof roll subgrade using static compaction method; avoid excessive compaction. Sub-excavate soft spots that develop during compaction and bring to proper grade by the addition of suitable fill material and then thoroughly compact until satisfactory, adding additional fill material as required.
- .4 Subgrade shall be naturally curved, sloped and graded to be self-draining.

3.3 Base Courses

- .1 Spread, shape and compact granular sub-base and or base material placed on the same day.
- .2 Compact base courses by rolling with power rollers capable of reversing without backlash. Use hand tamping or mechanical hand compaction equipment in areas inaccessible to rollers.
- .3 Install base and sub-base courses in layers not exceeding 150 mm in thickness. Compact the Granular `B` sub-base layer to 100% Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D1557 and the Granular `A` base layer to a minimum of 98% SPMDD in accordance with ASTM D1557 unless otherwise indicated.
- .4 Add water as required to obtain optimum density. Use calcium chloride to control dust.

Asphalt Paving

3.4 Asphalt Paving Courses

- .1 Place hot asphalt mixture over prepared dry base. Asphalt mixture shall be minimum 120° C when applied.
- .2 Roll each asphalt paving course to be smooth and uniform. Trim and tamp edges of pavement to a clean and straight line. There shall be no visible aggregate.
- .3 Compact each asphalt paving course in accordance with OPSS 310 requirements to a minimum of 92% Maximum Theoretical Relative Density (MTRD).
- .4 Thoroughly and uniformly compress the asphalt mixture by rolling soon after being spread, so that it will bear the roller without checking or undue displacement. Delays in rolling freshly spread mixture will not be permitted.
- .5 Consolidate with a power-driven roller of sufficient weight until all roller marks are eliminated, and no further compression is possible.
- .6 Along all places which are not accessible to the roller, thoroughly compact by means of hot tampers.
- .7 Curves: all curves shall conform to radii and lines indicated on the drawings. When necessary, construct forms, sufficiently braced to withstand the stress of placing and compacting the asphalt.
- .8 Leave edges of asphalt pavement exposed where indicated. Where edges are straight, lay pavement up to a wooden batter board. On completion of rolling, remove batter board and tamp edges. Where edges are curved, trim asphalt after rolling with a cutting tool and tamp edge.
- .9 Each asphalt paving course after final compaction shall be smooth and true to established crown and grade, and shall comply with the following dimensional tolerances:
 - .1 Thickness: plus 5 mm, minus 0.
 - .2 Surface variation: max. 5 mm in 3000 mm.

3.5 Joints

- .1 Construct joints to have same texture, density and smoothness as adjacent paving. Cut back edges of previously placed course to expose an even, vertical surface for full course thickness. Clean contact surfaces and apply asphalt tack coat.

Asphalt Paving

- .2 Offset transverse joints in succeeding courses not less than 600 mm. Offset longitudinal joints in succeeding courses not less than 150 mm.
- .3 Paint surfaces of curbs, manholes, gutters and other elements in contact with asphalt concrete paving with asphalt tack coat.
- .4 Jointing between the concrete pavement and hot mix pavement shall conform to OPSD 555.010.

3.6 Repairs

- .1 Where repairs are required, including repairs under warranty, cut asphalt to its full depth. Making straight and neat cuts.
- .2 Compact base in approved manner, adding Granular 'A' material as required.
- .3 Coat all exposed cut edges of existing asphalt pavement with tack coat. Place hot asphalt mixture and consolidate as specified to thickness required.

3.7 Pavement Markings

- .1 Paint parking zone lines and other pavement markings indicated.
- .2 Unless otherwise indicated paint lines 125 mm wide.
- .3 Paint lines straight, or uniformly curved, with well defined edges and full paint coverage in all locations.

3.8 Schedule

- .1 Dimensions indicated are compacted thicknesses. Please refer to the Geotechnical Investigation recommendations.
- .2 Provide light duty paving where indicated, as follows, unless otherwise shown on the drawings or directed by the Contract Administrator:
 - .1 40 mm HL3 asphalt surface course
 - .2 50 mm HL8 asphalt binder course
 - .3 150 mm top base course of Granular 'A'
 - .4 350 mm bottom base course of Granular 'B'.

Asphalt Paving

.3 Provide heavy duty paving where indicated, as follows, unless otherwise shown on the drawings or directed by the Contract Administrator:

- .1 40 mm HL3 asphalt surface course
- .2 60 mm HL8 asphalt binder course
- .3 150 mm top base course of Granular `A`
- .4 450 mm bottom base course of Granular `B`

END OF SECTION

Roadways

1 GENERAL

1.1 Section Includes

- .1 Asphalt concrete paving, curbs, and surface sealer; base course and wearing course.
- .2 Concrete pavement and sidewalks.
- .3 Crushed stone surfacing, compacted.
- .4 Curbs and gutters

1.2 References

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A 615/A615M-00, Specification for Deformed and Plain Billet - Steel Bars for Concrete Reinforcement.
 - .2 ASTM D 698-91(1999), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 600 kN-m/m³.
 - .3 ASTM D 946-82(1999), Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
 - .4 ASTM D 1557-91(1998), Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 2,700 kN-m/m³.
- .2 Canadian Standards Association (CSA):
 - .1 CSA A23.1/A23.2-94, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .3 The Asphalt Institute:
 - .1 MS-4, The Asphalt Handbook.
- .4 Province of Ontario Standards

1.3 Design And Performance Loads

- .1 Roadways:
 - .1 Design and construct for heavy duty commercial vehicles, movement of trucks up to 27,200 kg.
 - .2 Design and construct for local conditions, without evidence of pavement cracking, settlement, upward protrusions, or pot-holing.

Roadways

2 PRODUCTS

2.1 Materials – Asphalt Pavement

- .1 Asphalt Cement: ASTM D 946, OPSS 1150, OPSS Form 310, OPSS Form 1101.
- .2 Aggregate for Binder Course and Topping Coarse Mix: Province Highway Standard, OPSS 1101, OPSS 1150, OPSS 310.
- .3 Tack Coat: Homogeneous, medium curing, liquid asphalt, conform to OPSS 310.
- .4 Mix - Binder Course: 4.5 to 6 percent of asphalt cement by weight, conform to OPSS 310.
- .5 Mix - Surface Course: 5 to 7 percent of asphalt cement by weight, conform to OPSS 310.

2.2 Materials – Concrete Pavement

- .1 Concrete Materials: CSA A23.1/A23.2.
- .2 Joint Filler: Asphalt impregnated type; 12 mm thick.
- .3 Surface Retarder: Clear colour.
- .4 Joint Sealers: Pour grade Urethane type.

2.3 Materials – Curbs And Gutters

- .1 Reinforcing Steel: ASTM A 615; 300 MPa yield grade; deformed billet steel bars; unfinished galvanized epoxy coated finish.
- .2 Concrete Materials: CSA A23.1/A23.2. Provide to Province of Ontario Public Works Government Services Canada's standards.
- .3 Joint Filler: Asphalt impregnated Foam type; 12 mm thick.
- .4 Surface Retarder: Clear colour.
- .5 Joint Sealers: Pour grade Urethane type.

2.4 Subdrains

- .1 Road subdrains shall be provided as required in accordance with OPSS 405.05 and amended to accept only polyethylene Big "O" Boss 2000 or equivalent. The subdrain shall include filter wrap (non-woven type) in accordance with OPSS 1860.

Roadways

- .2 Provide positive drainage to the catchbasin or manhole for the entire length of drain.
- .3 Installation of subdrain including the connection to the CBMH/MH or CB with a water tight seal.

3 EXECUTION

3.1 Preparation Of Base Course

- .1 Prepare roadway subgrade in accordance with Province of Ontario standards.
- .2 Confirm compaction of subgrade is minimum 98 percent Standard Proctor Maximum Dry Density in accordance with ASTM D1557.

3.2 Installation – Asphalt Pavement

- .1 Perform Work in accordance with OPSS 310, 1003, 1101, and 1150.
- .2 Asphalt Course:
 - .1 Place binder course pavement to 100 percent of required compacted thickness.
 - .2 Place surface course pavement within two (2) hours to 100 percent of required compacted thickness.
- .3 Compact pavement by rolling.
 - .1 Do not displace or extrude pavement from position.
 - .2 Hand compact in areas inaccessible to rolling equipment.
- .4 Apply seal coat to surface course and asphalt curbs.

3.3 Installation – Concrete Pavement And Sidewalks

- .1 Moisten base to minimize absorption of water from fresh concrete.
- .2 Coat surfaces of manhole catch basin frames with oil to prevent bond with concrete pavement.
- .3 Place and secure forms to correct location, dimension, profile, and gradient.
- .4 Place joint filler vertical in position, in straight lines at perimeter of pavement. Secure to formwork during concrete placement.

Roadways

Place joint filler vertical in position, between separate concrete pours and between dissimilar surfaces (ie. at the building interface, between coloured and non-coloured concrete, at the curb interface and between heat traced and non-heat traced concrete)

.5 Place concrete to CSA A23.1/A23.2 Province of Ontario standards.

.6 Place concrete pavement to a single thickness.

Place contraction joints at 3 m intervals. Align curb, gutter, and sidewalk joints. Contraction joints to extend to 25% of the total depth of the concrete. Within the area of the heat tracing, the contraction joint shall be hand formed. Cutting the contraction joint with a saw shall not be permitted as this may sever the heat tracing wire. In this regard, the Contractor shall prepare a plan showing heat tracing wire, rebar and contraction joint locations and submit to the Consultant for review and approval prior to proceeding with the work. Heat tracing area limits defined on engineering drawings.

.7 Pavement Finish: Light broom.

.8 Place curing compound on exposed concrete surfaces.

.9 Maximum Variation of Surface Flatness: 6 mm in 3 m.

3.4 Installation – Curbs And Gutters

.1 Moisten subgrade to minimize absorption of water from fresh concrete.

.2 Place and secure forms to correct location, dimension, profile, and gradient.

.3 Place joint filler vertical in position, in straight lines.

.4 Place reinforcement as required.

.5 Place concrete to CSA A23.1/A23.2 Province of Ontario standards.

.6 Place contraction joints at 3 m intervals for sidewalk joints.

.7 Finish: Light broom.

.8 Place curing compound on exposed concrete surfaces.

.9 Conform to OPSS 353.

.10 Depressed curbs: OPSD: 351.010

Roadways

3.5 Quality Control

- .1 Inspection and testing shall be carried out by the Owner's inspection and testing agency in accordance with CAN/CSA-A23.1.
- .2 Contractor shall coordinate tests with the Owner's inspection and testing agency.
- .3 Contractor shall provide inspection and testing reports to the Consultant.

END OF SECTION

UNIT PAVING

PART 1- GENERAL

1.1 Summary

- .1 ASTM International
 - .1 ASTM C136-[13], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM C979/C979M-[10], Standard Specification for Pigments for Integrally Colored Concrete.
- .2 CSA Group
 - .1 CSA A23.1/A23.2-[09], Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A179-[04(R2009)], Mortar and Grout for Unit Masonry.
 - .3 CSA A231.1/A231.2-[06(R2010)], Precast Concrete Paving Slabs/Precast Concrete Pavers.
 - .4 CSA A283-[06(R2011)], Qualification Code for Concrete Testing Laboratories.

1.2 Action and Informal 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 [precast concrete unit paving] and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Submit full size sample of each type of paver.
- .4 Test and Evaluation Reports:
 - .1 Submit following sampling and testing data:
 - .1 Sieve analysis for gradation of bedding and joint material.
 - .2 Unit paver sampling and testing.
 - .3 Evaluation of [cleaning] [sealing] compound.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - .3 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
 - .4 Co-ordinate the following paragraph with Section 01 35 21 - LEED Requirements.

UNIT PAVING

1.3 Quality Assurance

- .1 Qualifications:
 - .1 Installer: company or person specializing in precast concrete paver installations approved by manufacturer with minimum 5 years of experience.
- .2 Mock-ups:
 - .1 Construct 3 x 3 m area mock-up.
 - .2 Mock-up will be used:
 - .1 To judge quality of work, substrate preparation, operation of equipment and material application.
 - .2 To determine surcharge of bedding layer, joint sizes, lines, laying patterns, colours and texture.
 - .3 Allow 24 hours for inspection of mock-up before proceeding with work.
 - .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.4 Delivery, Storage and Handling

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - 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, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect precast concrete units from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2- PRODUCTS

2.1 Concrete Pavers

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - with manufacturer's written instructions.

UNIT PAVING

- .2 Deliver, store and handle materials in accordance with Section 01 61 00 - with
Deliver, store and handle materials in accordance with Section 01 61 00 - with
Deliver, store and handle materials in accordance with Section 01 61 00 - with
For mechanically installed concrete pavers, laying panels should be supplied with
spacer bars on each unit. Bars ensure correct joint width between pavers.
Spacer bars also help prevent contact of the edges with adjacent pavers and
subsequent chipping.
- .3 Concrete pavers: to CSA A23.1/A23.2 and as follows:
 - .1 350mm x 546mm x 60mm 'Umbriano' by Unilock unit paver in
Winter Marvel colour.
 - .2 360mm x 360mm x 60mm 'Umbriano' by Unilock unit paver in
Winter Marvel colour.
 - .3 180mm x 360mm x 60mm 'Umbriano' by Unilock unit paver in
Winter Marvel colour
 - .4 Standard end, corner, border units as required.
- .4 Manufactured in moulds, with spacers, suitable for installation and delivered on
site in cubes of laying panels.
- .5 Pigment in concrete pavers: to ASTM C979/C979M. Select sand for bedding and
joint material, in accordance with local quality and availability.

2.2 Bedding and Joint Material

- .1 Use the following for bedding sand in areas subject to heavy vehicular traffic
such as main urban thoroughfares, exposed to more than 1.5 million 80 kN
equivalent axles over the pavement life, and in port, industrial and airport
applications.
- .2 Determine bedding sand hardness as follows:
 - .1 Randomly select single 1.4 kg sample from sand source.
 - .2 Dry sample for 24 hours at 115 degrees C to 121 degrees C.
 - .3 Obtain 3 sub-samples each weighing 0.2 kg by passing original sample
several times through riffle box.
 - .4 Carry out sieve analysis test on each sub-sample in accordance with CSA
A23.1/A23.2.
- .3 Remix each sub-sample and place in nominal litre capacity porcelain jar with two
(2) 25 mm diameter steel ball bearings weighing 75 +/-5 g each. Rotate each jar
at 50 rpm for six 6 hours. Repeat sieve analysis. Record individual and average
sieve analysis.
- .4 For each sample tested, maximum increase in percentages passing each sieve
and maximum individual percent passing is in accordance with table as follows:

UNIT PAVING

Sieve Size	Maximum Increase	Maximum Passing
0.075 mm	2%	2%
0.150 mm	5%	15%
0.300 mm	5%	35%

- .5 Bedding and joint sand: clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock or gravel. Do not use limestone screenings or stone dust.
- .6 Joint sand shall be Polymeric sand.
- .7 Gradation: to CSA A23.1/A23.2, Table 4 - Grading Limits for Fine Aggregate, and CAN/CSA-A179 as follows:

Sieve Designation	% Passing for Bedding Sand	Joint Sand
10 mm	[100]	
5 mm	[95-100]	[100]
2.5 mm	[80-100]	[95-100]
1.25 mm	[50-90]	[60-100]
630 microns	[25-65]	
600 microns	[35-80]	
315 microns	[10-35]	
300 microns	[15-20]	
160 microns	[2-10]	
150 microns	[2-15]	

2.3 Edge Restraints

- .1 For structural curbs, use 2.3.1. For restraining curb, select 2.3.2 or 2.3.3.
- .2 Edge restraints shall be as noted on plans and details.
- .3 Consult Interlocking Concrete Pavement Institute Tech Spec 3 - Edge Restraints for Interlocking Concrete Pavement, for guidance to select appropriate restraint type.
- .4 Structural curbs: See Site Civil drawings details and specifications.

2.4 Cleaning Compound

- .1 Manufacturers may void warranty on precast concrete pavers if cleaning compounds are used. Consult Interlocking Concrete Pavement Institute Tech Spec 5 - Cleaning and Sealing Interlock Concrete Pavement: A Maintenance Protection Guide.
- .2 Clear, organic solvent, designed and recommended by manufacturer for cleaning concrete pavers of contamination encountered.
- .3 Acid based chemical detergent, designed and recommended by manufacturer for removal of contamination encountered on pavers.

UNIT PAVING

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 precast concrete unit paving 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 Structural Surface

- .1 Ensure that structural surface preparation is specified to provide surface for installation of pavers.
- .2 Verify that structural surfaces conform to levels and compaction required for installation of unit pavers. If discrepancies occur, notify Consultant and do not commence work until instructed by Consultant.
- .3 Verify that top of structural surface (top of base) does not exceed plus or minus 10 mm of grade over 3 m straightedge.
- .4 Ensure that structural surface is not frozen or standing water is present during installation.

3.3 Structural Curbs

- .1 Verify that structural curbs conform to elevations and alignments required for installation of unit pavers. If discrepancies occur, notify Consultant and do not commence work until instructed by Consultant.

3.4 Installation of Edge Restraints

- .2 Install restraints true to grade, in accordance with manufacturer's recommendations.

3.5 Placing of Bedding Material

- .1 Ensure bedding material is not saturated or frozen at all times until installation is complete.
- .2 Spread and screed material on structural surface to achieve 25 mm compacted thickness after vibrating pavers in place. Do not use joint sand for bedding sand.

UNIT PAVING

- .3 Do not disturb screeded material. Do not use bedding material to fill depressions in structural surface.

3.6 Installation of Concrete Pavers

- .1 Generally, the space between pavers should be between 2 to 5 mm wide.
- .2 Lay pavers to patterns indicated. Joints between pavers: as recommended by manufacturer.
- .3 Use appropriate end, edge and corner stones. Saw cut pavers to fit around obstructions and at abutting structures.
- .4 Installation by mechanical equipment:
 - .1 Prepare installation sequence and obtain approval of sequence by Consultant.
 - .2 Place paver pallets and other materials without exceeding load bearing capacity, or otherwise detrimentally affecting installations.
 - .3 Run equipment approved for installation only on paving surfaces vibrated in place.
 - .4 Complete installation after placing each 100 square metres or after placing each 5 m width of installation.
 - .5 Inspect pavers and remove chipped, broken or otherwise damaged pavers if structural performance or aesthetics is adversely compromised as directed by Consultant.
 - .6 Replace pavers removed without altering layout and structural quality.
- .5 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding sand.
- .6 Inspect, remove, and replace chipped, broken and damaged pavers.
- .7 Sweep dry joint sand material into joints.
- .8 Settle sand by vibrating pavers with plate compactor.
- .9 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.
- .10 Complete installation to within 1 m of laying face, with sand-filled joints, at completion of each work day.
- .11 Sweep off excess joint material when installation is complete.
- .12 Proof roll street pavements with at least two passes of a 10 T rubber-tired roller.
- .13 Final surface elevations not to exceed plus or minus 10 mm under 3 m long straightedge.

UNIT PAVING

- .14 Surface elevation of pavers: 3 to 4 mm above adjacent drainage inlets, concrete collars or channels.
- .15 Ensure conformance of final elevations.

3.7 Precast Concrete Unit Cleaning

- .1 Cleaning is requirement prior to sealing.
- .2 Carry out cleaning at times and conditions recommended by manufacturer of cleaning compound and as directed by Consultant.
- .3 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.
- .4 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer's recommendations.
- .5 Final surface to be free of contamination.

3.8 Cleaning

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .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 11 - Cleaning.

END OF SECTION

Concrete Sidewalks, Curbs and Gutters

1 GENERAL

1.1 References

- .1 Canadian Standards Association (CSA).
 - .1 CSA A23.1-14. Concrete Materials and Methods of Concrete Construction.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.2-[M89], Boiled Linseed Oil.
 - .2 CAN/CGSB-3.3-[M89], Kerosene.
- .3 Ontario Provincial Standard Specification (OPSS).
 - .1 OPSS.MUNI 1350

1.3 Quality Assurance

- .1 Do concrete work in accordance with requirements of Division 3 except where otherwise specified herein.

2 PRODUCTS

2.1 Materials

- .1 Concrete materials: CSA A23.1-14.
- .2 Reinforcing steel:
 - .1 Bars: CAN/CSA-G30.18-M92, Grade 400, epoxy coated, or hot dip galvanized.
 - .2 Mesh: CSA G30.5-M1983 (R1991).
- .3 Formwork: steel or wood, capable of producing smooth and flat surfaces.
- .4 Concrete curing compound: ASTM C309, suitable for exterior use.
- .5 Expansion joint: asphalt impregnated fibre board, 12 mm thick, unless indicated otherwise; ASTM D1751.
- .6 Granular base: clean crushed stone or rock: Granular `A`, OPSS.MUNI 1010.

Concrete Sidewalks, Curbs and Gutters

- .7 Exposed aggregate paving materials:
 - .1 Aggregate shall be local pea gravel containing a size mix of 5 to 10mm diameter stone instead of crushed stone.
 - .2 Retarder: Preco EAC-S top surface retarder by Fosroc Inc. Construction Division, 150 Carley Court, Georgetown, KY 40324, tel: 502-863-6800, or approved equal.
- .8 Sealer: Sealtight CS-309 by W.R. Meadows.
- .9 Truncated Dome Detectable Warning Plates as per City of Guelph Standard Drawing 1-4, latest revision.

2.2 Concrete Mix

- .10 Unless otherwise indicated provide ready mix concrete designed by concrete producer, meeting the following requirements:
 - .1 Coarse aggregate: Standard maximum size 19 mm.
 - .2 Water-cement ratio: max. 0.45 by weight.
 - .3 Compressive strength: 32 MPa at 28 days.
 - .4 Air content: 6.5% +/- 1.5%.
 - .5 Slump at point of discharge: 80 +/- 30 mm.

2.3 Source Quality Control

- .1 Inform contract administrator of proposed source of material and provide access for sampling, if required, at least 4 weeks prior to commencing production.
- .2 If, in opinion of contract administrator, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise contract administrator 10 working days in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified or if its field performance is found to be unsatisfactory.

Concrete Sidewalks, Curbs and Gutters

3 EXECUTION

3.1 Grade Preparation

- .1 Do grade preparation work in accordance with Section 31 23 33 01 - Excavation, Trenching and Backfilling, 32 11 23 – Granular Base and 32 11 24 – Subbase.
- .2 Construct embankments using excavated material free from organic matter or other objectionable materials. Dispose of surplus and unsuitable excavated material off site.
- .3 Place fill in maximum 150 mm layers and compact to at least 98 percent of Standard Proctor Maximum Dry Density in accordance with ASTM D1557.

3.2 Granular Base

- .1 Obtain Contract Administrator's approval of subgrade before placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Compact granular base to a minimum of 98 percent of the Standard Proctor Maximum Dry Density in accordance with ASTM D1557.

3.3 Concrete

- .1 Obtain Contract Administrator's approval of granular base and reinforcing steel prior to placing concrete.
- .2 Do concrete work in accordance with this Section and Section 03 33 00 - Cast-in-Place Concrete.
- .3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
- .4 Provide edging as indicated with 10 mm radius edging tool.
- .5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Contract Administrator can be demonstrated. Hand finish surfaces when directed by Contract Administrator.

Concrete Sidewalks, Curbs and Gutters

3.4 Tolerances

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5 Expansion and Contraction Joints

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 1.5 m.
- .2 Install expansion joints as directed by Contract Administrator.
- .3 Install expansion joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .4 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.
- .5 Install joint filler in expansion joints in accordance with Section 03 33 00 - Cast-in-Place Concrete.
- .6 Seal expansion joints with sealant approved by Contract Administrator.

3.6 Curing

- .1 Cure concrete by adding moisture continuously in accordance with CAN/CSA-A23.1 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound approved by Contract Administrator.
- .2 Where burlap is used for moist curing, place two pre-wetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film. In accordance with manufacturer's requirements.

3.7 Backfill

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material approved by Contract Administrator. Compact and shape to required contours as indicated or as directed by Contract administrator.

Concrete Sidewalks, Curbs and Gutters

3.8 Linseed Oil Treatment

- .1 After concrete has cured for specified curing time and when surface of concrete is clean and dry, apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters.
- .2 Linseed oil mixture to consist of 50% boiled linseed oil and 50% mineral spirits by volume.
- .3 Apply treatment when air temperature above 10C.
- .4 Apply first coat at 135 mL/m.
- .5 Apply second coat at 90 mL/m when first coat has dried.

END OF SECTION

Painted Pavement Markings

1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 32 12 16 – Asphalt Paving

1.2 REFERENCES

- .1 CAN/CGSB-1.5-[M91], Low Flash Petroleum Spirits Thinner.
- .2 CGSB 1-GP-12c-[68], Standard Paint Colours.
- .3 CGSB 1-GP-71-[83], Method, of Testing Paints and Pigments.
- .4 CGSB 1-GP-74M-[79], Paint, Traffic, Alkyd.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Contract Administrator the following material sample quantities at least 4 weeks prior to commencing work.
 - .1 Two 1 L samples of each type of paint.
 - .2 One 1 kg sample of glass beads.
 - .3 Sampling to CGSB 1-GP-71.
- .3 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, CGSB specification number and formulation number and batch number.

2 PRODUCTS

2.1 MATERIALS

- .1 Paint:
 - .1 To CGSB 1-GP-74M, alkyd traffic paint.
 - .2 Colour: to CGSB 1-GP-12C, yellow 505-308, black 512-301, white 513-301.
 - .3 Upon request, Contract Administrator will supply a qualified product list of paints applicable to work. Qualified paints may be used but Contract Administrator reserves right to perform further tests.

Painted Pavement Markings

- .2 Thinner: to CAN/CGSB-1.5.
- .3 Glass beads:
 - .1 Overlay type: to CGSB 1-GP-74M.

3 EXECUTION

3.1 EQUIPMENT REQUIREMENTS

- .1 Paint applicator to be an approved pressure type distributor capable of applying paint in single, double and dashed lines. Applicator to be capable of applying marking components uniformly, at rates specified, and to dimensions as indicated, and to have positive shut-off.
- .2 Distributor to be capable of applying reflective glass beads as an overlay on freshly applied paint.

3.2 CONDITION OF SURFACES

- .1 Pavement surface to be dry, free from ponded water, frost, ice, dust, oil, grease and other foreign materials.

3.3 APPLICATION

- .1 Lay out pavement markings.
- .2 Unless otherwise approved by Contract Administrator, apply paint only when air temperature is above 10°C, wind speed is less than 60 km/h and no rain is forecast within next 4h.
- .3 Apply traffic paint evenly at rate of 3m/L.
- .4 Do not thin paint unless approved by Contract Administrator.
- .5 Symbols and letters to conform to dimensions indicated.
- .6 Paint lines to be of uniform colour and density with sharp edges.
- .7 Thoroughly clean distributor tank before refilling with paint of different colour.
- .8 Apply glass beads at rate of 200g/m of painted area immediately after application of paint.

Painted Pavement Markings

3.5 TOLERANCE

- .1 Paint markings to be within plus or minus 12mm of dimensions indicated.
- .2 Remove incorrect markings and re-paint at no extra cost to the contract.

3.6 PROTECTION OF COMPLETED WORK

- .1 Protect pavement markings until dry.

END OF SECTION

Tactile Warning Surfacing

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Tactile warning surfacing at locations indicated.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
 - .2 *Product* data sheets shall include material test reports from qualified independent testing laboratories, current within a 24 month period preceding date of installation, indicating that materials proposed for use in the *Work* are in compliance with the requirements of the *Contract Documents*, and meet the properties specified or indicated.
- .3 Shop drawings:
 - .1 Submit shop drawings showing fabrication details, tile placement, and installation methods and materials.
- .4 Samples:
 - .1 Submit full size sample of each type and colour of tactile warning surfacing specified or required for the *Work*.

1.3 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Maintenance data:
 - .1 Submit manufacturer's maintenance instructions for inclusion in the operation and maintenance manuals.

1.4 Quality Assurance

- .1 Qualifications:
 - .1 Installers: Shall have 3 years' experience, minimum, in application of *Products*, systems and assemblies specified, and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
 - .1 Provide a mock-up of single tactile warning installation.
 - .2 Locate at the *Place of the Work* as part of final installation.

Tactile Warning Surfacing

1.5 Field Conditions

- .1 Ambient conditions:
 - .1 Maintain minimum temperature of 5°C in spaces to receive tactile warning surfaces for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.

PART 2 - PRODUCTS

2.1 Performance/Design Requirements

- .1 Tactile warning surfacing, where required as a tactile attention indicator by the building code, shall conform to sentence (2) and Clauses 4.1.1 and 4.1.2 of ISO 23599, "Assistive Products for Blind and Vision-Impaired Persons – Tactile Walking Surface Indicators."

2.2 Materials

- .1 Tactile warning tiles:
 - .1 Length and width, nominal: s indicated.
 - .2 Acceptable *Product*:
 - .1 Kinesik 'Armor-Tile Surface Applied'.
 - .2 Colour: To later selection by the *Consultant* from the manufacturer's full range.
 - .3 Substitutions: in accordance with Section 01 25 00.
- .2 Anchors:
 - .1 Colour matched to tiles with which they are being used, flat head, drive anchors, 1/4" diameter x 1-1/2" long, as recommended and supplied by tactile warning surfacing tile manufacturer for use with tiles being installed.
- .3 Adhesive: as recommended and supplied by tactile warning surfacing tile manufacturer for use with tiles being installed.
- .4 Perimeter sealant: as recommended and supplied by tactile warning surfacing tile manufacturer for use with tiles being installed.

PART 3 - EXECUTION

3.1 Installation

- .1 Install tactile warning surfacing in accordance with tactile warning surfacing manufacturer's requirements and recommendations, to locations indicated, scheduled, or required by authorities having jurisdiction.
- .2 Anchors:
 - .1 Colour matched to tiles with which they are being used, flat head, drive anchors, 1/4" diameter x 1-1/2" long, as recommended and supplied by tactile warning surfacing tile manufacturer for use with tiles being installed.

Tactile Warning Surfacing

3.2 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

3.3 Adjusting and Cleaning

- .1 Clean tiles by method recommended by tile manufacturer not less than 4 days prior to inspection for *Substantial Performance of the Work*.

3.4 Protection

- .1 Protect tiles and installation against damage during construction period in accordance with the tile manufacturer's requirements and recommendations.
- .2 Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood in accordance with tile manufacturer's requirements and recommendations.

END OF SECTION

Site Furnishings

PART 1 - GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Bollards for electrical devices.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
 - .1 Submit product data sheets and include installation instructions for products.
- .3 Shop drawings:
 - .1 Include plans, elevations, fabrication details, hardware, and project specific installation details not covered in product data sheets.
- .4 Samples:
 - .1 Submit 2 samples of each finish specified.
- .5 Templates:
 - .1 Submit templates to *Contractor* for use by installers for proper location and installation of hardware.

1.3 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
 - .1 Submit operation and maintenance data for incorporation into maintenance manual.

PART 2 - PRODUCTS

2.1 Bollards for Electrical Devices

- .1 Material: Extruded aluminium, nominal 3 mm wall thickness, square, 0.4 mm corner radius.
- .2 Finish: 70% PVDF in accordance with AAMA 2605-20.
 - .1 Acceptable *Product*
 - .1 PPG 'Duranar'
 - .2 Colour: Bright Silver, to later selection by *Consultant* from manufacturer's full range.
- .3 Dimensions: 152 mm x 152 mm (6" x 6").
- .4 Cap: 13 mm thick mortised bollard cap, RF transparent black.

Site Furnishings

- .5 Preparations, Help button.
- .6 Bollard top: removable black ABS, painted to match bollard sides.
- .7 *Acceptable Product:*
 - .1 Wikk Industries 'Bollard Post Square (BPS Series)'.
 - .2 Substitutions: in accordance with Section 01 25 00.

PART 3- EXECUTION

3.1 Installation

- .1 *Provide* manufacturer's 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.
- .2 Install products in accordance with manufacturer's written requirements, true, tightly fitted, and level or flush to installation surfaces.
- .3 Incorporate reinforcing, fastenings and anchorage required for building in of *Products*.

3.2 Adjusting and Cleaning

- .1 Verify under work of this section that installed *Products* function properly, and adjust them accordingly to ensure satisfactory operation.

END OF SECTION

EXTERIOR SITE FURNISHINGS

PART 1- GENERAL

1.1 Summary

- .1 **General Requirements:** Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.

1.2 Shop Drawings and Product Literature

- .1 Submit shop drawings and product data as requested by the Landscape Architect.
- .2 Indicate dimensions, sizes, assembly, anchorage and installation details for each furnishing specified.

1.3 Maintenance Data

- .1 Provide maintenance data for care and cleaning of site furnishings at the time of project close out.

PART 2- PRODUCTS

2.1 Materials

- .1 **Bench Type 1:** Benches shall be model "MBE-2300-00018" with Gloss-Silver 14 finish on metal components and Ipe wood slats as manufactured by Maglin Site Furnishings, 800-716-5506 or approved alternate.

PART 3- EXECUTION

3.1 Installation

- .1 Assemble furnishings in accordance with manufacturer's instructions.
- .2 Install site furnishings true to line and level, plumb and true to finish grade as indicated on the drawings using the specified support or anchoring system.
- .3 Touch up damaged finished to the satisfaction of the Landscape Architect.

END OF SECTION

TOPSOIL AND FINISH GRADING-LANDSCAPE

PART 1- GENERAL

1.1 Summary

- .1 **General Requirements:** Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.

1.2 Source Quality Control

- .1 All topsoil to be used on planting beds, trees etc. must be tested by an approved testing laboratory such as A & L Canada Laboratories East Inc. or approved equal in accordance with General Requirements.
- .2 Test topsoil from source prior to stripping and stockpiling for :
 - .1 Particle size analysis (percentage of sand, silt and clay by Hydrometer Method).
 - .2 Organic matter, phosphorus (sodium bicarb), potassium, magnesium, calcium, soil pH, buffer pH, percent base saturation and calculated CEC. (Cation Exchange Capacity)
 - .3 Test for Sulphur, Zinc, Manganese, Iron, Copper, Boron and soluble salts content, and Atrazine.
- .3 Use 25 mm diameter sampling tube or spade and in presence of Consultant, take 25 samples per hectare to full depth of topsoil at random across entire area to be stripped. Mix samples together thoroughly before submitting for testing.
- .4 Submit 0.5 kg sample of topsoil to testing laboratory and indicate present use, intended use, type of subsoil and quality of drainage. Prepare and ship sample in accordance with provincial regulations and testing laboratory requirements.
- .5 The contractor shall arrange for and assume all costs for such testing of topsoil imported to the site and the amendment recommendation report. For on site topsoil stockpiles, unless otherwise provided for in this document, the tests and report shall be arranged by the contractor and paid for by the developer on Development projects and by the City on Capital projects. The City will be responsible for the costs of soil amendments to on site stockpiled topsoil.
- .6 Submit two copies of soil analysis and recommendations for corrections to sustain vigorous plant growth including recommended fertilizer applications to the Consultant before commencing of topsoil spreading and/or topsoil delivery.
- .7 Determine required lime or sulphur treatment to bring PH value of soil to 5.5 - 7.5 level.
- .8 Stock piled topsoil will be amended by shredder as per the recommendations for corrections.

TOPSOIL AND FINISH GRADING-LANDSCAPE

- .9 When the source of such topsoil is exhausted, topsoil from a new source shall not be used until tested and approved.

1.3 Scheduling of Work

- .1 Schedule placing of topsoil and finish grading to permit sodding operations under optimum conditions.

1.4 Delivery and Storage

- .1 Deliver and store fertilizer, lime Sulphur in water proof bags showing weight, analysis and name of manufacturer.

PART 2- PRODUCTS

2.1 Materials

- .1 Imported topsoil for *sodded areas*: friable, neither heavy clay nor of very light sandy nature consisting of 45% sand, 35% silt, 20% clay and pH of 6.2 to 7.2. Free from subsoil, roots, vegetation, debris, toxic materials, stones over 50 mm diameter, containing four percent (4%) **minimum** organic matter for clay loams and two percent (2%) **minimum** organic matter for sandy loams and must be capable of sustaining vigorous plant growth.
- .2 Imported topsoil for all *planting beds*: a triple mix, containing a minimum of 4% organic matter. Free from subsoil, roots, grass, weeds, toxic materials, stones, foreign objects and with an acidity range, PH, of 5.5 to 7.5. Topsoil containing crabgrass, cough grass, or noxious weeds is not acceptable.
- .3 Planting soil mix for planting of trees, shrubs and groundcovers shall be:
- .1 For planting of trees, mix topsoil with 20% peatmoss loose by volume.
- .2 Incorporate bonemeal in to planting soil at rate of 3 KG/M3 of soil mixture.
- .3 For special planting mixes see Section 02906, Planting of Trees, Shrubs, Groundcovers and Grasses.
- .4 Lightweight Topsoil For Second Floor Landscape:
- .1 40% Course Sand
- .2 40% Expanded Shale
- .3 20% Humus
- .5
- .6 Peat Moss: Shall be partially decomposed fibrous or cellular stems and leaves of Sphagnum Mosses with a texture varying from porous fibrous to spongy fibrous, fairly elastic and substantially homogeneous with a pH value of not less than 4.5 and not greater than 6.0. It shall be baled and free of decomposed colloidal residue, wood, sulphur and iron, be brown in colour and finely shredded, suitable for horticultural purposes. Shredded particles shall not exceed 5 mm in size.

TOPSOIL AND FINISH GRADING-LANDSCAPE

- .7 Manure: Well rotted, unleached cattle manure, free from harmful chemicals and other injurious substances and saw dust, shavings, or similar refuse, at least eight months old, but not more than two years old, and with no more than 25% straw, leaves or other unacceptable materials for planting use
- .8 Lime:
 - .1 Ground agricultural limestone containing a minimum 85% of total carbonates.
 - .2 Graduation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50 % passing 125 micrometer sieve.
 - .3 Use lime as indicated by acidity analysis of topsoil to bring PH to required level.
- .9 Bonemeal: raw bonemeal, finely ground with a minimum analysis of 3% nitrogen and 20% phosphoric acid.
- .10 Sand: hard, granular sharp sand to CSA A82. 56^a M1976, well washed and free of impurities, chemical or organic matter.
- .11 Sulphur: finely crushed agricultural elemental sulphur, free of impurities.
- .12 Fertilizer:
 - .1 Complete commercial synthetic fertilizer with minimum 65% insoluble nitrogen.
 - .2 Formulation ratio: 1:4:4.
 - .3 Bonemeal; finely ground with a minimum analysis of 20% phosphoric acid.

PART 3- EXECUTION

3.1 Preparation of Existing Grade

- .1 Grade soil, eliminating uneven areas and depressions, ensuring positive drainage. Remove soil contaminated with toxic materials. Dispose of removed materials as directed by Consultant.
- .2 Cultivate entire area which is to receive topsoil to depth of 100 mm. Repeat cultivation in those areas where equipment used for hauling and spreading has compacted soil.
- .3 Remove surface debris, roots, vegetation branches and stones in excess of 50 mm diameter.
- .4 Cultivate topsoil to depth of minimum 25 mm immediately prior to sodding or seeding.

TOPSOIL AND FINISH GRADING-LANDSCAPE

3.2 Spreading of Topsoil/Planting Soil

- .1 Spread topsoil after Consultant has inspected and certified rough grading.
- .2 Spread topsoil with adequate moisture in uniform layers over approved, unfrozen subgrade, where, sodding is indicated. Irregularities in the surface resulting from topsoiling or other operations shall be corrected to avoid the formation of depressions causing standing water.
- .3 For sodded areas keep topsoil 100 mm below finish grade.
- .4 Apply topsoil to following minimum depths: 100 mm for sodded areas.
- .5 Apply planting soil to following minimum depths: 300 mm for flower beds; 450 mm for shrub beds.
- .6 Manually spread topsoil/planting soil around existing trees, shrubs and obstacles.
- .7 Where any portion of the surface becomes gullied or similarly damaged, the Contractor will repair affected area adding topsoil as necessary to restore to the satisfaction of the Consultant.

3.3 Soil Amendments

- .1 Apply soil amendments at rate as specified and as determined from soil test and report.
- .2 Mix soil amendments into full depth of topsoil prior to application of fertilizer.

3.4 Application of Fertilizer

- .1 Apply fertilizer at least one week after limestone application.
- .2 Spread fertilizer uniformly over entire area of topsoil at manufacturer's recommended rate of application.
- .3 Mix fertilizer thoroughly to full depth of topsoil.

3.5 Finish Grading

- .1 Fine grade and loosen top soil. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Roll to consolidate topsoil for areas to be sodded leaving surface smooth, uniform, firm against deep foot printing, and with a fine loose, texture to approval of the Consultant.

TOPSOIL AND FINISH GRADING-LANDSCAPE

3.6 Restoration of Stockpile Sites

- .1 Restore stockpile sites to a 'rake clean' condition acceptable to the Consultant.

3.7 Surplus Material

- .1 Dispose of materials not required off site or as directed by the Consultant.

END OF SECTION

SODDING

PART 1- GENERAL

1.1 Summary

- .1 **General Requirements:** Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.

1.2 Source quality control

- .1 Sodding refers to the supply and placing of cultivated sod.

1.3 Delivery, Storage and Protection

- .1 Deliver sod to site within 24 hours of being harvested and lay sod within 36 hours thereafter, depending on suitable weather conditions and in accordance with good horticultural practice.
- .2 Small irregular or broken pieces of sod will not be accepted.
- .3 Schedule deliveries in order to keep storage at job site to minimum without causing delays.
- .4 During dry weather protect sod from drying and water sod as necessary to ensure its vitality and prevent dropping of soil in handling. Dry sod will be rejected.

1.4 Sample

- .1 Complete the installation of one sample panel of sod of a minimum 25 m² and have inspected and approved by the Landscape Architect prior to proceeding with the balance of sodding operations. All other work shall conform to this approved sample.

1.5 Inspection

- .1 Obtain the approval of the Landscape Architect of the finished topsoil surface before proceeding with sodding.

1.6 Acceptance

- .1 Maintain sod in good condition until acceptance.
- .2 Acceptance will be given when the sod is properly rooted, free of bare and dead spots and reasonably free of weeds in the opinion of the Landscape Architect.
- .3 Replace any deteriorated sod with new sod at the direction of the Landscape Architect.

SODDING

- .4 Sodded areas to be mown by contractor until acceptance and twice thereafter, with the first subsequent mowing to be performed a minimum of 7 - 10 days after acceptance has been granted.

PART 2- PRODUCTS

2.1 Materials

- .1 **Sod:** shall be certified No. 1 cultivated turf grass sod, grown and sold in accordance with the Classification of the Nursery Sod Growers Association of Ontario, latest edition, consisting of 40% Kentucky Bluegrass, 40% Creeping Red Fescue and 20% Perennial Ryegrass. At the time of sale it must have a strong, fibrous root system and be free of stones and burned or bare spots.
- .2 **Sod pegs:** 25 mm x 25 mm x 230 mm (minimum length). Ensure pegs are long enough to securely anchor sod.
- .3 **Water:** Potable.

PART 3- EXECUTION

3.1 Preparation

- .1 Rototill all areas that are to receive new sod. Cultivate to a minimum depth of 100 mm. Remove all rocks, roots and grass or weed clumps from the surface.
- .2 Scarify to a depth of 25 mm before placing additional topsoil or sod.

3.2 Laying of Sod

- .1 Obtain approval of Landscape Architect for topsoil grade and depth before starting sodding.
- .2 Lay sod during growing season. Sodding during extreme drought, at freezing temperatures or over frozen soil is not acceptable.
- .3 Lay sod with tight butt joints. Do not leave any open joints or overlap adjacent pieces of sod. Alternate joints on each row of sod.
- .4 Ensure finished sod surface is flush with adjoining grass areas, pavement or top surface of curbs.
- .5 On slopes steeper than 4:1, lay sod perpendicular to the slope and peg each row at intervals of not more than 600 mm on each side of the sod strip. Drive pegs flush with surface of sod.
- .6 Immediately after installation, water the sod with sufficient quantity

SODDING

- of water to penetrate the sod and the top 50 mm of the underlying topsoil.
- .7 Apply 5-20-20 slow release commercial fertilizer at recommended rate.
 - .8 When sod has dried sufficiently to prevent damage, roll all sodded areas to ensure a good bond between sod and topsoil.
 - .9 Protect all newly sodded areas with warning signs or barricades.
 - .10 The Owner covenants and agrees that it shall not lay sod or install landscaping during periods that lawn watering restrictions are in effect failing which the Owner agrees to pay to the Town the sum of ONE THOUSAND (\$1,000.00) DOLLARS for the first seven (7) day period and the sum of ONE HUNDRED AND FIFTY (\$150.00) DOLLARS per day thereafter during which the lawn watering restrictions remain in effect. Such payment may be charged to and collected from any performance security filed pursuant to this Agreement.

3.3 Maintenance

- .1 Water sodded areas in sufficient quantities and at required frequency to maintain subsoil immediately under sod continuously moist to depth of 75 to 100 mm. Contractor responsible for watering until acceptance.
- .2 Cut grass first time when it reaches height of 40 to 50 mm. Remove excessive clippings which will smother grassed areas. Contact Landscape Architect prior to any cutting to obtain approval.
- .3 Apply organic weed killer when broad leaf weeds start developing in competition with grass. Provide Landscape Architect with prepared product and application rates prior to use.
- .4 Fertilize sodded areas one month after sodding with 2:1:1 ratio fertilizer. Spread evenly at recommended rate and water thoroughly. Postpone fertilizing until next spring if application falls within four week period prior to expected end of growth season in locality.
- .5 Contractor responsible for maintenance until Substantial Performance of the Contract is achieved. Minimum 2 weeks between grass cutting operations. Sod must be in place minimum 30 days prior to inspection and acceptance by Owner. Sod to be 100% green, in good growing condition and 100% free of dead or barren spots.

END OF SECTION

TREES, SHRUBS AND GROUNDCOVERS

PART 1- GENERAL

1.1 Summary

- .1 **General Requirements:** Conform with requirements of all Sections of Division 1, General Requirements, as it applies to the work of this Section.

1.2 Source Quality Control

- .1 Install trees, shrubs and ground covers work in accordance with the Canadian Standards for Nursery Stock (latest edition), published by the Canadian Nursery Trades Association, except where specified otherwise.

1.3 Scheduling of Work

- .1 Tree planting is to occur prior to June 15 or after September 15. Tree planting may occur between June 16 and September 14 provided that the contractor employees the necessary maintenance of watering and monitoring of the trees as required in section 3.8 Maintenance During Establishment Period.

1.4 Delivery, Storage and Protection

- .1 Supply and deliver all materials such as fertilizers, bonemeal, mulches, etc., in standard containers clearly indicating contents, weight, analysis and name of manufacturer.
- .2 Where such materials are supplied in bulk, written statements shall be submitted to the City indicating the same information as if supplied in standard containers.
- .3 Store materials which are subject to deterioration resulting from weather or any other causes thereby impairing their effectiveness, in a dry waterproof place, follow regulations regarding Health and Safety.
- .4 Protect plants from damage and drying out from the time of digging until planting. Plant material left covered in excess of three hours will not be accepted. All bare root stock must be adequately protected and remain in moist condition until installed.
- .5 Plants shall be transported with every care taken to prevent damage to trunks and branches. The branches shall be carefully padded at points of contact with the equipment. Trees exhibiting any mechanical damage will not be accepted.
- .6 Plants shall be transported in trucks equipped with solid side and tops, or framing and canvas or tarpaulin sheeting to protect the entire plant from any element of the transportation process that would desiccate, bruise, burn, distort or damage the quality or character of the plant. Crowns wrapped for transport must be unwrapped prior to inspection.
- .7 Trunks shall not be used for hoisting purposes.

TREES, SHRUBS AND GROUNDCOVERS

- .8 Plants with broken or cracked rootballs, or plants which are strongly desiccated, will be subject to rejection upon arrival on the project site.
- .9 All plant materials which cannot be planted immediately upon arrival on the project site, shall be properly heeled or well protected with soil or similar material to prevent drying out and shall be kept moist until planting.

1.5 Qualifications

- .1 All work of this section shall be carried out by experienced personnel under the direction of a skilled foreman with a minimum 5 years of experience with planting and in strict accordance with the specification and best horticultural practice.

1.6 Substitutions

- .1 All plants shall be supplied as specified on the Plant List. Substitutions for species or size will not be accepted unless approved in writing by the Consultant.
- .2 Give timely notice, in writing, to the Consultant when applying for substitutions.

1.7 Inspection During Construction

- .1 Make all materials available for inspections at source of supply and/or upon arrival on the site.
- .2 Approval of plant materials at source of supply will not impair the right of the Consultant to reject plant materials during or after planting operations, which have been damaged or which have poor form and habit, or which do not conform to the specifications and/or drawings.
- .3 Give timely notice, in writing, to the Consultant when such materials are available for inspection.
- .4 Planting of materials prior to inspection by the Consultant will be the Contractor's responsibility and subject to rejection by the Consultant.
- .5 Remove all rejected materials from the site immediately.
- .6 Furnish all inspection certificates as may be required by federal, provincial and other applicable regulations.
- .7 Do not remove any labels from plants unless directed to do so by the Consultant.

PART 2- PRODUCTS

2.1 Materials

- .1 All plant materials shall meet the highest horticultural standards of the Canadian Nursery Trades Association with respect to grading and quality, and shall be in strict accordance with the Plant List and Specifications.

TREES, SHRUBS AND GROUNDCOVERS

- .2 All plants shall be number one (1) grade, nursery grown, under proper cultural practices with respect to fertile soil, ample spacing, regular cultivation, weed, pest and disease control, adequate moisture and pruning, in accordance with good horticultural practices as advocated by the Canadian Nursery Trades Association. All such plants shall have been transplanted and/or root pruned regularly, but not later than (36) thirty six months prior to arrival on the site. The Contractor shall submit sources of plant material, in writing, if so requested by the Consultant.
- .3 All plants shall be legibly tagged with their proper name and size and source. Tags must remain in place until approved by the Consultant.
- .4 Nomenclature of specified plants shall conform to the international Code of Nomenclature for Cultivated Plants and shall be in accordance with the approved scientific names given in the latest edition of Standardized Plant Names. The names of the varieties not named therein shall conform to the names accepted in the nursery trades.
- .5 Any plants dug from native stands, woodlots, orchards or neglected nurseries and which have not received proper cultural maintenance as advocated by the Canadian Nursery Trades Association, shall be designated as "Collected Plants". These plants are not permitted.
- .6 Plants shall be sound, healthy, vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs or larvae and shall have healthy, well developed root systems. All shrubs and trees shall possess all characteristics of the specified kind with all the leaders intact, undamaged and uncut, growing from an unmutated root system and exhibiting previous 2 years shoot elongation as typical. The stems shall be free from sun-scalds, frost cracks, abrasions, fire and rusts. All old injuries shall be completely calloused over. Pruning wounds must show vigorous bark on all edges. Root balls should be weed free.
- .7 All plants shall conform to the measurements specified in the plant list, except that plants larger than specified may be used if approved by the Consultant. Use of such plants shall not increase the contract price. If larger plants are approved, the ball of earth shall be increased in proportion of the size of the plants.
- .8 All plants shall be measured when the branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to root base or from branch tip to branch tip. Trees that exhibit weak graft unions shall not be accepted. Minimum branching height for deciduous trees shall be 1800 mm.
- .9 Where trees are measured by Caliper (cal.), reference is made to the diameter of the trunk measured 150mm above ground as the tree stands in the nursery. All plant materials shall be nursery grown under climatic, soil and local site conditions similar to those on the contract site for at least two (2) years. Certification of the origin of the plant material shall be required.

TREES, SHRUBS AND GROUNDCOVERS

- .10 All plant materials specified shall be the best available quality. Trees indicated as "specimen" on the plant list shall be supreme examples of the particular species without irregularities or blemishes. They shall be uniform in character with all other "specimens" of the same species required under this contract.
- .11 All plant materials shall be moist, showing active green cambium when cut. Coniferous plants that are dry, brittle or showing a faded green not typical of the species will not be acceptable. Coniferous trees, with the exception of Colorado spruce and ornamental cedars, are to be unclipped. All trees shall have only one unpruned central leader soil amendments.
- .12 **Trees:** Damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are not permitted. All trees to be native and/or locally grown and properly acclimatized.
- .13 **Shrubs and Multi-Stem Trees:** All persistent, thriving stems arising from the root crown or just above the root crown and foliage is allowed to remain intact on branches close to the ground.
- .14 **Groundcover, Grasses and Vines:** Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems. Container grown stock is required.
- .15 **Annuals and Biennials:** Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.
- .16 **Topsoil:**
 - .1 Contractor shall be permitted to utilize any on-site topsoil removed for construction purposes for use in planting beds or tree pits. Additional topsoil shall be supplied from approved commercial sources. All topsoil for planting purposes, from either on-site sources or supplied, shall be tested under the terms of the contract.
 - .2 All topsoil used for planting purposes shall be screened, fertile, friable, natural loam containing four percent (4%) minimum organic matter for clay loams and two percent (2%) minimum organic matter for sandy loams. Acidity of topsoil shall range from 6.0 pH to 7.5 pH (levels of NPK and Mg are to be noted). It shall be free of any mixture of subsoil, clay lumps, stones, and roots over 50mm in diameter and any toxic materials or foreign objects and shall be reasonably free of weeds and weed seeds.
 - .3 Planting soil for planting of trees, shrubs, and ground covers: mix topsoil with 30% 'Zephyr' peat moss. Incorporate bonemeal into planting soil at rate of 3kg/m³ of soil mixture.

TREES, SHRUBS AND GROUNDCOVERS

- .4 The Contractor shall be required to have the topsoil tested. Prior to submitting samples for testing the topsoil must be approved at the source by the Consultant. The analysis is to be preformed by a Soil Testing Laboratory at the contractor's expense. Two copies of the test results, along with a soil sample, are to be forwarded to the Consultant. The analysis shall include evaluating whether the soil meets the definition as set in subsections 2.2.2 and 2.2.4, and an evaluation of the capability of the soil to promote good plant growth. In soils with a low moisture holding capacity the city may require the Contractor apply Urea based polymers or hydrogel to the planting soil.
- .5 Test topsoil from source providing 0.5kg samples to an approved testing laboratory, and indicate present use, type of subsoil and quality of drainage. Prepare and ship the samples in accordance with Provincial regulations and testing laboratory requirements.
 - .1 The testing must identify if the following elements are present in harmful levels; atrazine, salts, pre-emergent herbicides, growth inhibitors or soil sterilant and heavy metals.
 - .2 Should the test results indicate the topsoil is not satisfactory the report shall include recommendations to improve the soil. The City reserves the right to reject topsoil that does not meet the standards.
 - .3 If the Soils Analysis concludes that amendments are required they shall be undertaken by the contractor, at his expense. Soil testing analysis of the amended soil shall be at the direction of the Consultant, at the Contractors' expense.
- .17 **Peat Moss:** Partially decomposed fibrous or cellular stems and leaves of Sphagnum Mosses with a texture varying from porous fibrous to spongy fibrous, fairly elastic and substantially homogeneous with a ph value of not less than 4.5 and not greater than 6.0. It shall be baled and free of decomposed colloidal residue, wood, sulphur and iron, be brown in colour and finely shredded, suitable for horticultural purposes. Shredded particles shall not exceed one-quarter 6.3cm (1/4 inch) in size.
- .18 **Fertilizers:**
 - .1 Organic fertilizers applied to surface of planting saucer or bed, 2 times per year. Rates of fertilizer application shall be adjusted upon receipt of soil test reports. The Contractor shall be required to add fertilizer to the topsoil planting mixture based upon the following minimum rates:
 - .1 Rate of application: 5-4-7 @ 5 kg. per 100 m2 for planting beds.
 - .2 For trees, fertilization is to be implemented as a liquid application injected in to the ground.
 - .1 Rate of application: 30-8-8, fertilizer is to contain magnesium.

TREES, SHRUBS AND GROWDCOVERS

- .19 **Bonemeal:**
 - .1 Bonemeal shall be commercial raw bonemeal, finely ground and with a minimum analysis of four percent (4%) nitrogen and twenty percent (20%) phosphoric acid.
 - .2 Bonemeal shall be added at the rate of 600 grams per cubic metre of planting soil mixture.
- .20 **Water:** Free of impurities that would inhibit plant growth.
- .21 **Guys and Tie Wires:** ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.
- .22 **Upright and Guy Stakes:** 2-Heavy duty gage T bars 2438mm (8'-0") long for trees, shall be drilled to secure tire wires and be sufficiently long to be driven securely into the sub-grade minimum 300mm to frost, see also details.
- .23 **Flexible Ties:** Wide rubber or elastic bands or straps of length required to reach stakes or compression springs.
- .24 **Tree-Tie Webbing:** UV-resistant polypropylene or nylon webbing with brass grommets.
- .25 **Guy Cables:** Five-strand, 3/16-inch (4.8-mm-) diameter, galvanized-steel cable, with zinc-coated compression springs, a minimum of 3 inches (75 mm) long, with two 3/8-inch (10-mm) galvanized eyebolts.
- .26 **Trunk Protection:** 150mm diameter Corrugated drain collar 400mm in height.
- .27 **Root Barrier:** Root barriers are required where planting is in close proximity to underground systems and pipes and to prevent disturbance of paved surfaces in the long term.
- .28 **Mulch:** Shredded Pine Mulch sample to be submitted to the Consultant for approval prior to installation.
- .29 **Anti-Dessicant:** Wax-like emulsion.
- .30 **Landscape Fabric:**
 - .1 Landscape Fabric installed as per manufacturers specifications and in accordance with the detail and bid form.
 - .2 Erosion mat installed as per manufacturers specifications and in accordance with the detail and bid form.

PART 3- EXECUTION

3.1 Preparation

TREES, SHRUBS AND GROUNDCOVERS

- .1 Ensure plant material acceptable to Consultant.
- .2 Remove damaged roots and branches from plant material.
- .3 Apply anti-dessicant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

3.2 Excavation and Preparation of Planting Beds

- .1 Planting
 - .1 Planting shall be done during suitable periods with respect to weather conditions and locally accepted practice and to the Consultant's approval. Plants shall be set plumb in the centre of the pit and at the same relation to grade as originally grown, allowing for settlement.
 - .2 Trees and other plant materials shall be faced to give the best appearance or relationship to adjacent structures, and to the approval of the Consultant.
 - .3 Set plants in filled pits or beds of soil mixture, allowing at least 150mm of soil mixture under each plant. Place landscape fabric over bed, cut opening for plants. Overlap fabric as per manufacturer's specification. Remove all ropes, wires, etc., and pull burlap away from top of rootball. Set bare root plants so that their roots lie in their natural position.
 - .4 Backfill soil mixture in layers not exceeding 150mm in depth.
 - .5 Constantly tamp soil around rootball to eliminate air pockets. Soak soil mixture thoroughly with water when hole is filled half-way. Fill hole completely, leaving a shallow saucer directly over root ball, and slightly smaller in diameter than the excavation.
 - .6 Backfill to a height above finished grade sufficient to allow for normal, natural settlement. Finished grade, after settlement, shall be as shown on drawings.
 - .7 Prune only as necessary to remove dead, broken or interfering branches and to compensate for loss of roots as a result of digging operations in nursery.
 - .8 Supply and place mulches for tree saucers and planting beds as shown on drawings. Mulch shall be 75-100mm in depth for trees and in shrub beds 100mm.
 - .9 Water trees and planting beds thoroughly immediately

TREES, SHRUBS AND GROUNDCOVERS

after planting.

- .10 Remove all wire, rope and burlap from the top 1/3rd of the rootball. Dispose off site (do not fold or bury).
- .11 The Contractor covenants and agrees that it shall not lay sod or install landscaping during periods that lawn watering restrictions are in effect failing which the Contractor agrees to pay to the Town and/or Owner the sum of ONE THOUSAND (\$1,000.00) DOLLARS for the first seven (7) day period and the sum of ONE HUNDRED AND FIFTY (\$150.00) DOLLARS per day thereafter during which the lawn watering restrictions remain in effect. Such payment may be charged to and collected from any performance security filed pursuant to this Agreement.

3.3 Mulching

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated.

3.4 Clean Up

- .1 Immediately after planting, remove all excess materials, rubbish and debris, from the site, leaving the area neat and tidy. Clean all areas which are contaminated as a result of planting operations and reinstate to existing conditions or better.

3.5 Certificate of Substantial Completion

- .1 Prior to the issuance of the Certificate of Substantial Completion, all plants and materials shall be completely free of disease and/or insect infestation and in a healthy and vigorous growing condition. Proof of fertilization, peat moss and bone meal additives will be required. Tree stakes shall be taut and all accessories in good condition as specified. Planting areas and tree saucers shall be freshly cultivated and free of weeds and debris.
- .2 At the end of the specified guarantee period the Consultant will inspect all planting and provide Final Acceptance Certificate.

3.6 Warranty

- .1 "Nursery Grown" plants installed during the period from April 15th to October 31st, and for which a Substantial Completion has been issued shall be guaranteed for twenty-four (24) months from date of substantial completion.
- .2 "Nursery Grown" plants installed after October 31st, for which a

TREES, SHRUBS AND GROUNDCOVERS

certificate of substantial completion has been issued shall be guaranteed for twenty-four (24) months from April 15th of the following year.

- .3 The guarantee of "Approved Collected Plants" shall extend for a period of two (2) years beyond the periods stated for "Nursery Grown Plants".

3.7 Maintenance During Establishment Period

- .1 Contractor shall provide a schedule indicating when fertilization, weeding, watering will be undertaken. Payment for this component is inclusive in the bid price.
- .2 Maintenance of all plants shall include all measures necessary to establish and maintain all plants in an acceptable, vigorous and healthy growing condition, throughout the specified guarantee period, including, but not limited to:
 - .1 Cultivation and weeding of planting beds and tree pits. When herbicides are used for weed control, they shall be applied in accordance with manufacturer's recommendations, planting beds with significant weeds or grass should be sprayed with Round-up; all applications shall be in accordance with MOE application guidelines.
 - .2 Pruning including the removal of dead, or broken branches and treatment of pruning wounds.
 - .3 Disease, insect and rodent control, when required. When chemicals are used for such control, they shall be used in accordance with manufacturer's recommendations; and
 - .4 Maintenance of all accessories in good condition such as, tree guys, turnbuckles, stakes, etc., including adjustment of turnbuckles to keep tree guys tight and repair and replacement of accessories when required. Remove all hardware, stakes, guying etc. at end of warranty period.

3.8 Maintenance During Warranty Period

- .1 The Contractor shall water all plants sufficiently to maintain vigorous, healthy growth from time of installation until the end of the specified guarantee period.
- .2 The Contractor shall be responsible for pre-winter rodent protection of all materials deemed susceptible to rodent attack, and pesticide applications necessary to control weeds and unwanted grasses.
- .3 Through the guarantee period the Contractor shall make periodic

TREES, SHRUBS AND GROUNDCOVERS

inspections of all plant materials and notify the Owner and the Consultant of any corrective or preventative measures which are necessary to safeguard the plants.

- .4 All coniferous trees shall be wrapped by November 30th and removed by April 15th during the guarantee maintenance period.
- .5 Prior to final acceptance, at end of final warranty period all planting saucers shall be cultivated and re-mulched, tree stakes and collars removed.

3.9 Replacements

- .1 Plant material found dead within the special guarantee period, or not in a healthy, satisfactory growing condition, or which do not meet the requirements of the specifications, shall be replaced by the Contractor at his own expense.
- .2 The cost of replacements resulting from theft, vandalism, careless or neglect on the part of others, or any cause due to circumstances beyond the control of the Contractor, shall be borne by the Owner.
- .3 All replacements shall be plants of the same size and species as originally specified and shall be supplied and planted in accordance with the drawings and specifications as directed by the Consultant. The guarantee period for replacements shall be the same length as the guarantee period for the original plant material and shall extend from the date of acceptance of the replacement. Any replacement must be undertaken immediately upon notification of the City, Owner or as identified by the Contractor during the periodic inspections required during the guarantee period.
- .4 Tag or mark, in a permanently visible manner, all replacement trees and notify the Consultant in writing of the date on which replacements were planted. Include sketch showing location of replaced plants.
- .5 Plant replacements at a time which is in accordance with good horticultural practice.
- .6 When notified by the Consultant, remove all accessories and cut a grade those trees which are to be replaced at a later date.

END OF SECTION

Manholes and Catchbasins

1 GENERAL

1.1 References

- .1 ASTM A48 - 83(1990), Specification for Gray Iron Castings.
- .2 ASTM C139-73(1989), Specification for Concrete Masonry Units for Construction of Catch Basins and Maintenance.
- .3 ASTM C478M-90, Specification for precast Reinforced Concrete Maintenance Sections.
- .4 ASTM D698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
- .5 CAN/CSA-A5-M88, Portland Cement.
- .6 CAN/CSA A8-M88, Masonry Cement.
- .7 CAN/CSA-A23.1-M90, Concrete Materials and Methods for Concrete Construction.
- .8 CSA-A82.56-M1976, Aggregate for Masonry Mortar.
- .9 CAN3-A165 Series-M85, CSA Standards on Concrete Masonry Units.
- .10 CAN/CSA-G30.18-M92, Billet Steel Bars for Concrete Reinforcement.
- .11 CAN/CSA-G164-M92, Hot dip Galvanizing of Irregularly Shaped Articles.
- .12 Ontario Provincial Standard Specification and Drawings (OPSS and OPSD).

1.2 Material Certification

- .1 Submit manufacturer's test data and certification at least 10 working days prior to commencing work. Include manufacture's drawings, information and shop drawings where pertinent.
- .2 Certification to be marked on units.

1.3 Scheduling Of Work

- .1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions to Owner and Consultant for approval and adhere to approved schedule.

Manholes and Catchbasins

1.4 Shop Drawings

- .1 Submit shop drawing in accordance with project Submittal Procedures.

2 PRODUCTS

2.1 Materials

- .1 Cast-in-place concrete:
 - .1 Perform in accordance to Section 03 30 00 - Cast-in-Place Concrete.
 - .2 Concrete reinforcement: to Section 03 20 00 - Concrete Reinforcing.
- .2 Precast manhole/catchbasin units
 - .1 Cast iron maintenance hole lids shall be as per OPSS 1850 and OPSD 401.010 Type "A" closed cover.
 - .2 Joints: to be made watertight using rubber rings.
 - .3 Mortar:
 - .1 Aggregate: to CSA A82.56.
 - .2 Cement: to CAN/CSA-A8.
 - .4 Ladder rungs: to CAN/CSA-G30.18
 - .5 Adjusting rings: to ASTM C478M.
 - .6 Concrete Brick: to CAN3-A165 Series.
 - .7 Drop manhole pipe: to be same as sewer pipe.
 - .8 Frames, gratings, covers to dimensions as per the following requirements:
 - .1 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment.
 - .2 Manhole frames and covers: heavy duty municipal type for road service. Cover cast without perforations and complete with two 25mm square lifting holes.
 - .3 Catchbasin frames and grates
 - .1 Cast iron catchbasin frames and grates shall conform to OPSS 1850 and OPSD 400.100.
 - .9 Granular bedding and backfill: to Section 31 05 16 – Aggregates: General and following requirements:
 - .1 Crushed or screed stone, gravel or sand.
 - .2 Gradations shall be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CG SB-8.1.

Manholes and Catchbasins

.3 Concrete mixes and materials: to Section 03 30 00 - Cast-in-Place Concrete.

.10 Unshrinkable fill: to Section 31 23 16 - Excavation, Trenching and Backfilling.

3 EXECUTION

3.1 Excavation And Backfill

- .1 Excavate and backfill in accordance with Section 31 23 16 – Excavation, Trenching and Backfilling.
- .2 Place unshrinkable backfill in accordance with Section 31 23 16 - Excavation, Trenching and Backfill.

3.2 Concrete Work

- .1 Perform concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Place concrete reinforcement in accordance with Section 03 20 00 – Concrete Reinforcing.

3.3 Installation

- .1 The installation of manholes and catchbasins shall be as per OPSS 407.
- .2 Construct units plumb and true to alignment and grade.
- .3 Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying shall be allowed.
- .4 Dewater excavation and remove soft and foreign material before placing concrete base.
- .5 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100 % Standard Proctor Maximum Dry Density (SPMDD).
- .6 Precast units:
 - .1 Set bottom section of precast unit on bedding specified. Make each successive joint watertight with approved rubber ring gaskets.
 - .2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
 - .3 Plug lifting holes with precast concrete plugs set in non-shrink grout.

Manholes and Catchbasins

- .7 For sewers:
 - .1 Place stub outlets and bulkheads at design elevations.
 - .2 Bench to provide a smooth U-shaped channel.
- .8 Installing units in existing systems:
 - .1 Where new unit is to be installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
 - .2 Make joints watertight between new unit and existing pipe.
 - .3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready to be put in operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
- .9 Set frame and cover to required elevation on no more than 150 mm courses of brick. Make brick joints and join brick to frame with cement mortar. Parge and make smooth and watertight.
- .10 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.
- .11 Install safety platforms in manholes having depth of 5 m or greater.

3.4 Adjusting Tops of Existing Units

- .1 Remove existing gratings, frames and I beams and store for re-use or dispose off-site.
- .2 Sectional units:
 - .1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
 - .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section. When amount of raise is less than 600 mm use standard manhole brick, modoloc or grade rings.
- .3 Monolithic units:
 - .1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation with cast- in-place concrete.
 - .2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.

Manholes and Catchbasins

- .4 When monolithic units with tapered upper section are to be lowered more than 150 mm, remove concrete for entire depth of taper plus as much straight wall as necessary, then rebuild upper section to required elevation with cast-in-place concrete.
- .5 Install additional manhole ladder rungs in adjusted portion of units as required.
- .6 Re-use existing gratings, frames and I beams where possible.
- .7 Re-set gratings and frames to required elevation on not more than 4 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.
- .8 Re-set gratings and frames to required elevation on full bed of cement mortar, parge and trowel smooth.

3.5 Sealing Over Existing Units

- .1 Cut galvanized iron sheet to extend 50 mm beyond opening of existing manhole or catch basin grating. Center iron sheet over existing grating and spot or stitchweld to grating.

3.6 Leakage Test

- .1 Install watertight plugs or seals on inlets and outlets of each new manhole and fill manhole with water. Leakage not to exceed 0.3% per hour of volume of manhole.
- .2 If permissible leakage is exceeded, correct defects.
- .3 The Consultant shall issue a Test Certificate for each manhole passing the test.

END OF SECTION

Watermains

1 GENERAL

1.1 References

- .1 ANSI/AWWA B300-(92), Water Treatment - Hypochlorites.
- .2 ANSI/AWWA B301-(92), Water Treatment - Liquid Chlorine.
- .3 ANSI/AWWA C104/A21.4-(90), Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
- .4 ANSI/AWWA C111/A21.11-(90), Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
- .5 ANSI/AWWA C110/A21.10-(87), Ductile Iron and Gray Iron Fittings, 3 inch through 48 inch for Water and Other Liquids.
- .6 ANSI/AWWA C151/A21.51-(1986), Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or other Liquids.
- .7 ANSI/AWWA C203-(86), Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
- .8 ANSI/AWWA C205-(89), Cement Mortar Protective Lining and Coating for Steel Water Pipe - 4 inch and larger - Shop Applied.
- .9 ANSI/AWWA C206-(88), Field Welding of Steel Water Pipe.
- .10 ANSI/AWWA C207-(86), Steel Pipe Flanges for Waterworks Service, 4 inch through 144 inch.
- .11 ANSI/AWWA C208-(83), Dimensions for Fabricated Steel Water Pipe Fittings.
- .12 ANSI/AWWA C301-(92), Prestressed Concrete Pressure Pipe Steel Cylinder Type for Water and Other Liquids.
- .13 ANSI/AWWA C303-(87), Reinforced Concrete Pressure Pipe Steel Cylinder Type, Pretensioned for Water and Other Liquids.
- .14 ANSI/AWWA C500-(86), Gate Valves for Water and Sewage Systems.
- .15 ANSI/AWWA C504-(1988), Valves, Rubber-Seated, Butterfly.
- .16 ANSI/AWWA C600-(87), Installation of Ductile Iron Watermains, and their Appurtenances.

Watermains

- .17 ANSI/AWWA C602-(89), Cement Mortar Lining of Water Pipelines - 100 mm and larger - In Place.
- .18 ANSI/AWWA C603-(90), Installation of Asbestos Cement Pressure Pipe.
- .19 ANSI/AWWA C800-(89), Underground Service Line Valves and Fittings.
- .20 ANSI/AWWA C900-(89), Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch for Water Distribution.
- .21 AWWA C906: Standard for Polyethylene (PE) Pressure Pipe and Fittings 4 inch through 65 inch for Water Distribution.
- .22 ANSI/ASME B16.1-(1989), Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
- .23 ASTM B62-(90), Specification for Composition Bronze or Ounce Metal Castings.
- .24 ASTM B88M-(92), Specification for Seamless Copper Water Tube.
- .25 ASTM A307-(91), Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- .26 ASTM C136-(84a), Method for Sieve Analysis of Fine and Coarse Aggregates.
- .27 ASTM C117-(90), Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .28 ASTM C478M-(90b), Specification for Precast Reinforced Concrete Manhole Sections.
- .29 ASTM D698-(91), Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
- .30 ASTM D2310-(91), Classification for Machine Made Reinforced Thermosetting Resin Pipe.
- .31 ASTM D2657-(90), Practice for Heat Joining of Polyolefin Pipe and Fittings.
- .32 ASTM F714-(90), Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- .33 CAN/CGSB-8.1-(88), Sieves Testing, Woven Wire.
- .34 CAN/CGSB-8.2-(M88), Sieves Testing, Woven Wire, Metric.

Watermains

- .35 CGSB 1-GP-12c-(68), Standard Paint Colours.
- .36 CAN/CSA-A8-(M88), Masonry Cement.
- .37 CSA A82.56-(M1976), Aggregate for Masonry Mortar.
- .38 CAN/CSA-B137.1-(M89), Polyethylene Pipe, Tubing and Fittings for Cold Water Pressure Services.
- .39 CAN/CSA-B137.3-(M90), Rigid Poly (Vinyl Chloride) (PVC) Pipe for Pressure Applications.
- .40 CAN/CSA-G30.18-(M92), Billet Steel Bars for Concrete Reinforcement.
- .41 CAN/CSA-G164-(M92), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .42 CAN/CSA-A257 Series-(M92), Standards for Concrete Pipe.
- .43 ASTM A53-(90b), Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
- .44 ANSI/AWWA C200-(91), Water Pipe 6 Inches and Larger, Steel.
- .45 CAN/ULC-S520-(M91), Standard for Fire Hydrants.
- .46 CAN4-S543-(M84), Internal Lug, Quick-Connect Couplings for Fire Hose.
- .47 City of Guelph, Linear Infrastructure Standards, 2023 (latest revision).
- .48 City of Guelph, Development Engineering Manual, 2023 (latest revision).

1.2 Material Certification

- .1 Submit manufacturer's test data and certification that pipe materials meet requirements of this section at least 10 working days prior to commencing work. Include manufacturer's drawings, information and shop drawings where pertinent.

1.3 Shop Drawings

- .1 Submit shop drawings in accordance with project Submittal Procedures.
- .2 Submit complete shop drawings and construction schedule for watermains.
- .3 For precast chambers include shop drawings detailing thrust restraints.

Watermains

1.4 Record Drawings

- .1 Provide data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details, maintenance and operating instructions.

1.5 Cold Weather Work

- .1 Protect all work from freezing.
- .2 Do not lay pipes on frozen soil.

1.6 Protection Against Floatation

- .1 Prevent damage to any pipeline due to hydrostatic uplift during construction and until the work is completed.

1.7 Scheduling Of Work

- .1 Schedule work to minimize interruptions to existing services.
- .2 Submit schedule of expected interruptions to the Consultant for approval and adhere to interruption schedule as approved by the Consultant.
- .3 Notify the Consultant and building manager a minimum of 2 working days in advance of any interruption in service.
- .4 Do not interrupt water service for more than 3 h and confine this period between 10:00 and 16:00 h local time.
- .5 Notify fire department of any planned or accidental interruption of water supply to hydrants.
- .6 Advise local police department of anticipated interference with movement of traffic.

2 PRODUCTS

2.1 Pipe, Joints And Fittings

- .1 Pipe Materials:
 - .1 Supply fittings suitable for and compatible with Class and type of pipe with which they will be used.

Watermains

- .2 Polyvinyl Chloride (PVC) pressure pipe: to ANSI/AWWA C900, pressure class 235, cast iron outside diameter, certified to CSA B137.3
- .3 PVC pipe fittings shall conform to AWWA C-907 and certified to CSA B137-2.

2.2 Valves And Valve Boxes

- .1 For valves equal to and less than 300mm: gate valves shall be resilient wedge conforming to AWWA C509.
- .2 For valves greater than 300mm: gate valves shall be either double disk with 75 mm bypass conforming to AWWA C500. Valve box shall accommodate the bypass and gear reducer.
- .3 All gate valves shall be iron body, bronze mounted with inside screw, non-rising spindle and a 50mm operating nut that opens by turning counter-clockwise.
- .4 Gate valves in sizes 100mm to 350mm shall have mechanical joint ends.
- .5 Acceptable suppliers: Mueller or Clow
- .6 Cast iron valve boxes shall be a screw type box with a No. 6 base supplied by Bibby, Mueller or Star.

2.3 Valve Chambers

- .1 Cast Iron Maintenance Hole Lids
 - .1 Cast iron maintenance hole lids shall be as per OPSS 1850 and OPSD 401.010 Type A as manufactured by Bibby or East Jordan.
- .2 Adjustment Units
 - .1 Concrete adjustment units shall be as per OPSS 407 and OPSD 704-01. Precast adjustment units shall be laid in a full bed of mortar with successive units being joined using sealant as recommended by the manufacturer. A minimum of one (1) adjustment unit shall be installed with a minimum height of 75mm. A maximum of four (4) adjustment units may be installed to a height not in excess of 300mm.
 - .2 Concrete brick and mortar shall not be used.

2.4 Hydrants

- .1 Hydrants shall conform to AWWA C502 for Dry Barrel Hydrants and shall open clockwise by a 32mm square operating nut. Hydrants shall have tapped drain ports, 150mm mechanical joint inlet with brass to brass fittings on the main valve seal, two 63.5 mm (2.5 in) hose nozzles spread 180 degrees apart and a 114.3 mm (4.5 in) pumper nozzle with a 100 mm ULC approved Stortz connection.

Watermains

- .2 Hydrants shall be connected to the main using 150 mm lead, 150 gate valve and anchor tee.
- .3 Hydrants shall be supplied for a minimum 2.3 m depth of trench.
- .4 A maximum of one (1) hydrant extension (300 mm or less for new development) shall be allowed, between the upper and lower hydrant barrels for deeper installations.
- .5 Hydrants shall be set such that break flange is between 0 mm and 75 mm above finished grade.
- .6 Hydrants barrels shall be painted chrome yellow with a high gloss exterior paint over a quick dry oxide primer. The port caps and bonnet shall be painted dark green (Multiguard 2500 self-priming enamel – Green 40004 as manufactured by Multiplex Chemicals Ltd. Or approved equal). Stortz nozzles shall be painted black. The size of the adjacent watermain in inches shall be painted in black letters 200mm high on the face of the hydrant barrel facing the Street.
- .7 Acceptable Product and Suppliers:
 - .1 McAvity Brigadier Style M-67 by Crane (Canada) Limited
 - .2 East Jordan Iron Works 5CD250 HYD MJ-2AD WTRMSTR STZ
 - .3 Mueller (Modern Centurian)
 - .4 Canada Valve (Century)

2.5 Fittings

- .1 Cast Iron and Ductile Fittings:
 - .1 Manufactured to the latest edition of ANSI A21.10 (AWWA C110) specifications.
 - .2 Cement-mortar lined on the interior conforming to the latest edition of ANSI A21.4 (AWWA C104) specifications.
 - .3 Furnished with mechanical joints conforming to the latest edition of ANSI A21.11 (AWWA C111) specifications.
 - .4 Shall be installed with polyethylene encasement as per ductile iron pipe installation in accordance with the latest ANSI (AWWA) specifications or wrapped with 'Denso' tape.

Watermains

.2 Ductile Iron Compact Fittings:

- .1 Manufactured to the latest edition of ANSI A21.53 (AWAA C153) specifications;
- .2 Furnished with mechanical type ends;
- .3 Cement-mortar lined on the interior conforming to the latest edition of ANSI 21.4 (AWWA C104) specifications;
- .4 Shall be installed with polyethylene encasement as per ductile iron pipe installation in accordance with the latest ANSI (AWWA) specifications or wrapped with 'Denso' tape.
- .5 Hyprotec fittings shall be used with Hyprotec pipe installation.

.3 Victaulic Fittings:

- .1 Victaulic fittings are approved for all AWWA pipes excluding PVC pipes.

.4 Restrainer Gland Rings

- .1 E900 PVC Pipe to standard mechanical joint fittings
 - .1 Sigma Model PVM
 - .2 Uni-flange Model 1300
- .2 C-900 PVC Bell and Spigot Joints
 - .1 Sigma Model PVP
 - .2 Uni-flange Model 1390

2.6 Couplings

.1 Line Closure Couplings (Acceptable Suppliers):

- .1 Robar Style 1408
- .2 Smith Blair 411
- .3 Mueller Viking Johnson Maxfit
- .4 Hymax 2000

Watermains

2.7 Union Couplings (Acceptable Suppliers):

- .1 Cambridge Brass Series 118
- .2 Mueller 15400 Series
- .3 Ford Pack Joint C44

2.8 Chamber Adjustment Units

- .1 Precast "Moduloc" Units.

2.9 Pipe Bedding And Surround

- .1 Material
 - .1 Refer to Section 31 05 16 – Aggregates: General

2.10 Backfill Material

Refer to Section 31 23 16 – Excavation, Trenching and Backfilling.

3 EXECUTION

3.1 Transporting, Unloading and Pipe Storage

- .1 Take delivery of pipes and fittings near to trench. Do not impede traffic.
- .2 Remove from site and replace all pipes, specials, fittings and gaskets that are unsound or damaged.
- .3 Unload pipe using mechanical equipment. Do not use chains for slinging pipe.
- .4 Place materials in safe storage.
- .5 Follow pipe manufacturer's handling and storage recommendations.
- .6 The Contractor shall be responsible for the safe handling and storage of pipes, specials, fittings, gaskets, etc., at his own expense and risk.
- .7 The Contractor shall be responsible for replacing all pipe specials, fittings, gaskets, etc., which are unsound or damaged.

Watermains

3.2 Concrete Bedding and Encasement

- .1 Perform concrete work in accordance with Section 03 30 00 – Cast-in-Place Concrete.
- .2 Pipe shall be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- .3 Do not backfill over concrete within 24 h after placing.

3.3 Granular Bedding

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness. Refer to applicable OPSD.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to at least 98% Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D1557.
- .6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 16 - Excavation, Trenching and Backfilling.

3.4 Jointing - General

- .1 Clean Joint Surfaces.
- .2 Lubricate pipe ends with material recommended by pipe manufacturer.
- .3 Follow manufacturer's instructions in jointing pipes.
- .4 Keep pipe parallel to previously laid pipe. Sling pipe only at centre.
- .5 Pull or push pipe only by hand or power operated winch. Do not use backhoe for pushing pipe.
- .6 Prevent joints from opening after pipe has been laid.

Watermains

3.5 Jointing Ductile Iron and PVC Pipe

.1 Mechanical Joints:

- .1 Slip gland on pipe with lip extension toward joint. Slip gasket on pipe with thick edge toward gland.
- .2 Push spigot end to its seat in bell. Press gasket to seat evenly around joint.
- .3 Position gland for bolting and insert bolts. Make up all nuts tightly with fingers.
- .4 Tighten nuts half a turn at a time with calibrated torque wrench. Tighten all nuts uniformly to torque specified in AWWA C111/A21.11.

.2 Bell and Spigot Joints:

- .1 Place gasket in groove of bell making certain it is properly seated.
- .2 Lubricate gasket.
- .3 Align pipes to be joined and then carefully enter spigot into bell until spigot end just makes contact with gasket.
- .4 Complete entry of spigot into bell by use of jack-type pulling tool until second reference mark is flush with face of bell.

3.6 Installation of Pipes – General

.1 Watermain Laying Tolerance

- .1 The allowable laying tolerance from that shown on the Construction Drawings for all sizes and along the entire length of watermains shall be:
 - .1 Horizontal: 50 mm
 - .2 Vertical: 25 mm

.2 Joint and Pipe Deflection

- .1 The deflection of joints shall not exceed that recommended by the pipe manufacturer. Pipe barrels shall not be deflected to any degree or placed under lateral or vertical stress.

Watermains

.3 Joint and Thrust Restraint

- .1 Joint and thrust restraint, poured-in-place concrete, shall be installed on mains up to and including 300 mm diameter:
 - .1 As shown on the Construction Drawings.
 - .2 As shown on the pipeline shop drawings.
 - .3 At all horizontal and vertical bends.
 - .4 As shown on approved shop drawings.
- .2 Mechanical joint restraints shall be installed on mains of all sizes:
 - .1 On all main valves, hydrant leads, flushing and swab ports and all service laterals 100 mm or greater in size.
 - .2 In areas where concrete thrust blocking to undisturbed soil is impractical.
 - .3 In areas subject to settlement.
 - .4 All joints to be restrained as per approved shop drawings.

.4 Tracer Wire

- .1 The tracer wire shall be installed as per the applicable standard drawings and taped to the top centre of all non-metallic watermain and service piping at 5 m intervals.
- .2 Splices and other wire to wire connections shall be made by soldering or using Dryconn No. 10999 waterproof connectors or by using copper split bolts.
- .3 For soldered connections, wires shall be stripped bare, twisted together, cleaned with soldering paste, soldered, wrapped with dielectric tape and over-wrapped with vinyl tape.
- .4 For waterproof connectors, wires shall be stripped bare to the recommended length, twisted together and fastened by twisting on the sealed connector. Connections shall only comprise the approved wire size and quantity combinations specified for the connector.
- .5 For copper split bolt connections, the connector and bare wire shall be wrapped with dielectric tape and over-wrapped with vinyl tape.

Watermains

- .6 The tracer wire on non-metallic systems shall NOT be connected to new or existing metallic watermain piping and/or associated fittings connected to the metallic watermain in order not to interconnect corrosion protection systems.
- .7 An 5.5kg Zinc anode shall be installed at the terminus of the tracer wire which is not otherwise connected to an existing tracer wire. For services, the tracer wire shall be connected to the nut provided on the curb stop.
- .5 Corrosion Protection
 - .1 Non-Metallic Mains
 - .1 For non-metallic watermains with metallic valves, fittings, appurtenances and non-metallic service laterals, one 5.5 kg Zinc anode shall be attached to the tracer wire at intervals not to exceed 100 meters. The anode shall be connected to the tracing wire.
 - .2 The tracer wire shall be connected to all metallic fittings.
 - .3 A 5.5 kg Zinc anode shall be installed at the terminus of tracer wire not connected to an existing tracing wire.
 - .4 Anodes on CPP watermains shall be placed in accordance with the construction drawings and specifications.
 - .2 Metallic Mains
 - .1 For metallic watermains (i.e., DI), the copper lead wire of the anode shall be wrapped once around the watermain before being connected to the watermain or fitting using "Cadweld" type waterproof connection. The copper lead wire is to be connected to copper service connections via main stops provided with electrical ground connectors.
 - .2 The use of polyethylene bags or wrapping shall not be used as the method of corrosion protection.
 - .3 Wire Connections
 - .1 Connections shall be soldered and wrapped with vinyl tape to prevent corrosion.
 - .4 Anode Offset
 - .1 The packaged anode shall be placed parallel to the watermain, 0.3 metres from the pipe.

Watermains

.6 Bolts, Nuts and Washers

- .1 Bolts, nuts and washers used on buried fittings shall be Co-ten, zinc coated, cadmium coated or stainless steel.
- .2 If the Contractor elects to use Cor-Ten, zinc coated or cadmium coated bolts, nuts and washers on buried fittings, the entire connection shall be covered with a petrolatum tape system which shall be installed in accordance with the manufacturer's instructions.

.7 Warning Tape

- .1 Warning tape for non-potable watermains shall be placed on top of the granular pipe bedding over the centreline of the pipe and secured from movement during backfilling.

3.7 Cutting of Pipe

- .1 Whenever cutting of pipe is required, cut pipes as recommended by pipe manufacturers.

3.8 Change in Line and Grade

- .1 Provide fabricated bends for change in line and grade of 5° or more.
- .2 Use bevel adaptors with laying lengths of less than 300 mm for deflections of 2.5 to 5°.
- .3 Deflections of 2.5° or less shall be made in the pipe joint.

3.9 Thrust Protection

- .1 Protect All Connections, Caps And Bends That Are Liable To Draw Or Blow-Off By means of mechanically restrained joints and concrete thrust restraints as per OPSD 1103.010 and 1103.020.
- .2 All mechanical restrainers shall be cathodically protected with a 5.5 kg zinc anode connected to the restraint.

3.10 Shutting Down or Charging Mains

- .1 All existing valves are to be operated by the operating authority having jurisdiction. The Contractor shall not be permitted to operate valves within existing systems.
- .2 Provide two working days notice of a request to have an existing system operational.

Watermains

3.11 Connections

- .1 Provide all labour, materials and equipment to make connections in accordance with the submitted plan and with pipe manufacturer's recommendations. Undertake field welding in accordance with the general requirements of AWWA C206.
- .2 Undertake work on a continuous basis until connections are complete or until the supply of water is established. Complete all connections in the time allowed.
- .3 All connection fittings and closure pieces shall be chlorinated and pressure tested in accordance with these Contract Documents and to the satisfaction of the Owner prior to the recharging of the watermain.
- .4 All thrust restraints shall be thoroughly established prior to recharging of the watermain.
- .5 Restore any damage to existing watermains, including pipe, linings, coatings, encasement, bedding, etc., to original conditions or better.

3.12 Watermain Connections - General

- .1 This Section specifies the requirements and restrictions for making the connections between the new watermain and the existing watermain.
- .2 The Contractor shall submit in writing a detailed methodology of the proposed method of connecting the new watermain to the existing watermains. Note that prior to connecting to the existing watermains, the Contractor shall pressure test and chlorinate the new watermain. The Owner will advise the Contractor where they will be able to obtain water for the purpose of the testing.
- .3 Include in the methodology a detailed description of the methods, materials, subcontractors, specialized equipment and time requirements to complete the connection including the draining and dechlorination as well as the disposal of water from existing watermains, the manufacture, installation and disinfection of the tie-in pieces.
- .4 Provide working and erection drawings in accordance with Section 01 33 00 – Submittal Procedures 15 working days before work is to be completed.
- .5 The shutdown of the existing watermains shall be coordinated with the Owner who shall dictate the exact day and timing of the shutdown.
- .6 Coordinate with the Owner as to which residences and businesses will be affected by the shutdown. The Contractor shall make arrangements for the supply of temporary water to those affected.

Watermains

- .7 Prior to the connections to the existing watermain, the Contractor shall review the proposed plan of action in detail with the Owner who must be thoroughly convinced that all provisions and stand-by equipment are in place and operating satisfactorily. The Owner reserves the right to request modifications to the proposed plan to address any perceived problems and the right to refuse to allow connection to the existing watermain until all concerns have been addressed.
- .8 Revisions to the connection plan which are requested by the Owner or delays resulting from such requests shall not be considered reason for an extra claim to the Contract.
- .9 A detailed schedule shall be provided to the Owner for review 5 working days in advance of proposed shutdown.
- .10 Provide suitable illumination for work undertaken during the hours of darkness.
- .11 Include in the cost for the connections all labour, materials and equipment to undertake and complete the connection. This shall include, but not be limited to, tees, reducers, piping, temporary and/or permanent fittings, etc., provision of thrust restraint, disinfection and testing of fittings and the recharging of the watermain.
- .12 No extra payment will be made for construction methods to keep excavations dry, stable and free from unwanted substances.
- .13 No extra payment will be made for the time of day or day of the week the connections can be made.
- .14 The Contractor shall bear sole responsibility for any claims, which can be directly attributed to an interruption in service. This includes, but is not limited to, personal losses, business losses and fire losses.
- .15 Prior to commencing with pipe laying, expose the existing watermain to confirm the location of the pipe joints and to determine if any modifications are required to the procedures and to allow field measurements to be taken.
- .16 Coordinate the order and delivery of all special equipment and fittings required for the connections well in advance. All such equipment, including stand-by, must be on site and in working condition prior to commencing with the connections.
- .17 Take delivery of all materials, fittings, etc., near the location of use. Do not impede traffic.

Watermains

- .18 Whenever cutting of pipe is required, cut pipes as recommended by pipe manufacturer.
- .19 Discharge water in accordance with this section.
- .20 Where flanged fittings are specified, gaskets shall be 3mm thick full face rubber.

3.13 Valve Installation

- .1 Install valves to manufacturer's recommendations at locations as indicated on the Contract Drawings.
- .2 Support all valves located in valve chambers. Refer to applicable Standard Drawings and OPSD.

3.14 Valve Chambers

- .1 Use either cast-in-place or precast units as approved by the Consultant.
- .2 Submit shop drawings for approval in accordance with Section 01 33 00 – Submittal Procedures and include details for thrust restraint.
- .3 Place reinforcing steel and miscellaneous metals required to be embedded in concrete to details indicated and in accordance with Section 03 30 00 – Cast-in-Place Concrete.
- .4 Cast bottom slabs for precast units directly on undisturbed ground, or set precast concrete slab on 150 mm minimum of compacted granular bedding.
- .5 Set bottom section of precast unit in bed of cement mortar and bond to bottom slab. Make each successive joint watertight with approved rubber ring gaskets, mastic joint filler, cement mortar, or combination thereof.
- .6 Clean surplus mortar and joint compounds from interior surface of valve chamber as work progresses.
- .7 Plug lifting holes with mortar.
- .8 Set frame and cover to required elevation on at least 150 mm courses of brick. Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.
- .9 Place frame and cover on top section to design elevation. If adjustment is required use concrete ring.

Watermains

- .10 Clean valve chambers of debris and foreign materials; remove fins and sharp projections.

3.15 Thrust Blocks

- .1 Perform concrete work in accordance with Section 03 30 00 – Cast-in-Place Concrete.
- .2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as directed by the Consultant.
- .3 Keep joints and couplings free of concrete.
- .4 Do not backfill over concrete within 24 h after placing.
- .5 Install a polyethylene bond breaker between thrust blocks and fittings.

3.16 Flushing And Disinfection of Watermains

- .1 Flushing and disinfecting operations are to be under direct control of the Consultant. Notify the Consultant at least five working days in advance of proposed date when disinfection operations to commence.
- .2 The Consultant may permit or require flushing to be carried out in stages as sections of system are completed. Ensure that no unwanted matter is allowed to enter sections which have been flushed.
- .3 After flushing is completed, let water from existing distribution system flow at controlled rate into new pipeline and introduce liquid chlorine solution so that chlorine is distributed throughout the entire section.
- .4 Disinfection shall be carried in accordance with OPSS 701. The chlorine injection concentration and the chlorine concentration at any point in the piping shall not exceed 100 ppm.
- .5 Taking of samples and testing for chlorine residual to be carried out by the Consultant.
- .6 Leave system charged with 50 ppm chlorine solution for 24 hours.
- .7 Operate all valves and hydrants during this 24 hour period.
- .8 Test chlorine residual in section after 24 hours.

Watermains

- .9 If tests indicate a chlorine residual of not less than 25 ppm, flush section completely and recharge with water normal to operation of system. If test does not meet requirements, repeat chlorination procedure until satisfactory results are obtained.
- .10 After system has been recharged, take a sample for bacteriological tests. If there is an indication of contamination, repeat disinfection procedure.
- .11 Do not put system into operation until clearance has been given by the authority having jurisdiction.

3.17 Disposal of Water

- .1 Dispose of safely, all chlorinated water from draining operations or used for testing, flushing or disinfecting waterworks.
- .2 Do not discharge untreated chlorinated water into any storm sewer, drainage ditch, water course or sanitary sewer.
- .3 Provide acceptable equipment and additives to neutralize chlorinated water which is to be wasted. Residual chlorine in the discharge water shall not exceed 0.02 mg/L. Approved dechlorinating agents are as follows:
 - .1 Hydrogen Peroxide
 - .2 Sulphur Dioxide
 - .3 Sodium Sulphite
 - .4 Sodium Metabisulphite

3.18 Hydrostatic Testing

- .1 Notify the Consultant two working days in advance of all proposed testing.
- .2 Conduct hydrostatic pressure and hydrostatic leakage tests under supervision of the Consultant, upon completion of watermain including backfilling and after flushing and chlorination of the watermain.
- .3 Hydrostatic pressure and hydrostatic leakage tests may be conducted either simultaneously or separately.
- .4 Duration of test shall be two hours if tests are performed simultaneously.
- .5 If two tests are performed separately, conduct hydrostatic pressure test before hydrostatic leakage test. Duration of pressure test to be one hour. Duration of leakage test to be two hours Confirm that the maximum pressure at any point along the test sections do not exceed pipe rating.

Watermains

- .6 Test pressures to be 1035 kPa (150 psi) measured at the highest point on the line. Test pressures measured at lower elevations shall be increased appropriately (1 m elevation = 9.79 kPa = 1.42 psi).
- .7 Hydrostatic Pressure Test:
 - .1 Hydrostatic pressure test shall be carried in accordance with OPSS 441.
 - .2 Fill test section slowly with water making sure that all air is removed from pipeline. Provide blow-offs at high points in the system.
 - .3 Allow a period of 24 hours before starting test.
 - .4 Subject test section to continuous test pressure of 1035 kPa (150 psi) for two hours for municipal right-of-ways and 1379 kPa (200 psi) for site plans (2 hours).
 - .5 On successful completion of this test remove blow-offs and insert plugs.
 - .6 Examine all parts of test section while under pressure. If test pressure is maintained with no pressure drop for specified test duration, the test results are satisfactory.
 - .7 If test is not satisfactory, repair all deficient parts of section and retest until satisfactory result is attained.
- .8 Hydrostatic Leakage Test:
 - .1 Fill test section slowly with water making sure that all air is removed from the pipeline.
 - .2 Allow a period of 24 hours before starting test.
 - .3 Subject test section to continuous test pressure of 1035 kPa (150 psi) for one hour.
 - .4 Leakage is the amount of water added to test section in order to maintain test pressure for test duration.
 - .5 Compare measured leakage with allowable leakage as calculated for test section.
 - .6 Allowable leakage: 0.82 litres per mm of pipe diameter per km of pipe for the 2-hour test period.
 - .7 If measured leakage exceeds allowable, locate and repair all leaks and retest section until a satisfactory result is obtained.

Watermains

3.19 Pipe Surround

- .1 Upon completion of pipe laying surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact each layer from pipe invert to spring line of pipe to 98% Standard Proctor Maximum Dry Density (SPMDD) in accordance with ATSM D1557.
- .6 Compact each layer from spring line of pipe to underside of backfill to 98% SPMDD.

3.20 Backfill

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Compact backfill to at least 98% SPMDD.

3.21 Surface Restoration

- .1 After installing and backfilling over watermains, restore surface to original condition.

END OF SECTION

Site Sanitary Sewerage Piping

1 GENERAL

1.1 References

- .1 ASTM C 14M-95, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe.
- .2 ASTM C 76M-98, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
- .3 ASTM C 117-95, Standard Test Method for Material Finer Than 75 MU m (No. 200) Sieve in Mineral Aggregates by Washing.
- .4 ASTM C 136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .5 ASTM C 428-97, Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
- .6 ASTM C 443M-98, Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric).
- .7 ASTM C 663-98, Standard Specification for Asbestos Cement Storm Drain Pipe.
- .8 ASTM D 698-91(1998), Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m).
- .9 ASTM D 1869-95, Standard Specification for Rubber Rings for Asbestos Cement Pipe.
- .10 ASTM D 2680-95a, Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .11 ASTM D 3034-98, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and fittings.
- .12 ASTM D 3350-98a, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- .13 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire.
- .14 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
- .15 CAN/CGSB-34.9-M94, Pipe, Asbestos Cement, Sewer.
- .16 CAN/CSA-A5/A8/A362-93, Portland Cement/Masonry Cement/Blended Hydraulic Cement.

Site Sanitary Sewerage Piping

- .17 CSA A60.1-M1976, Vitrified Clay Pipe.
- .18 CSA A60.3-M1976, Vitrified Clay Pipe Joints.
- .19 CAN/CSA-A257 Series-M92, Standards for Concrete Pipe.
- .20 CAN/CSA-B70-97, Cast Iron Soil Pipe, Fittings, and Means of Joining.
- .21 CAN/CSA-B182.1-96, Plastic Drain and Sewer Pipe and Pipe Fittings.
- .22 CAN/CSA-B182.2-95, PVC Sewer Pipe and Fittings (PSM Type).
- .23 CSA B182.6-M98, Profile Polyethylene Sewer Pipe and Fittings.
- .24 CSA B182.11-95, Recommended Practice for the Installation of Plastic Drain and Sewer Pipe and Pipe Fittings.

1.2 Material Certification

- .1 Submit manufacturer's test data and certification at least 10 working days prior to commencing work.
- .2 Ensure certification is marked on pipe.

1.3 Shop Drawings

- .1 Submit shop drawings in accordance with project Submittal Procedures.

1.4 Samples

- .1 Submit samples in accordance with project Submittal Procedures.
- .2 Inform independent testing agency at least 10 working days prior to commencing Work, of proposed source of bedding materials and provide access for sampling.
- .3 Submit to independent testing agency for testing at least 10 working days prior to commencing work, following samples of materials proposed for use: Bedding materials, pipe surround, pipe, manholes.

1.5 Scheduling Of Work

- .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

Site Sanitary Sewerage Piping

- .3 Notify Consultant and building manager 2 working days minimum in advance of any interruption in service.

1.6 Manufacturers Instructions

- .1 Submit manufacturers information data sheets and instructions in accordance with Section 01 33 00- Submittal Procedures.

2 PRODUCTS

2.1 Concrete Pipe

- .1 Reinforced circular concrete pipe and fittings: to CAN/CSA-A257 and ASTM C 76M designed for flexible rubber gasket joints to CAN/CSA-A257 and ASTM C 443M.
 - .1 Acceptable suppliers: Hanson, Concast, Coldstream, Munro, Hyprescon, M-Con, Rainbow.
- .2 Lifting holes:
 - .1 Pipe 900 mm and less diameter - no lift holes.
 - .2 Pipe greater than 900 mm diameter - lift holes not to exceed two in a piece of pipe.
 - .3 Provide pre-fabricated plugs to effectively seal lift holes after installation of pipe.

2.2 Plastic Pipe

- .1 Type PSM Polyvinyl Chloride (PVC): to ASTM D 3034 CAN/CSA-B182.2.
 - .1 Standard Dimensional Ratio (SDR): 35
 - .2 Locked-in gasket and integral bell system.
 - .3 Acceptable suppliers: IPEX, Rehau, Royal

2.3 Service Connections

- .1 Type PSM Poly (Vinyl) Chloride: to CAN/CSA-B182.2.
 - .1 Standard dimensional ration (SDR): 28
 - .2 Acceptable material: IPEX, Rehau, Royal

2.4 Cement Mortar

- .1 Portland cement: to CAN/CSA-A5/A8/A362, normal type 10.

Site Sanitary Sewerage Piping

- .2 Mix mortar one part by volume of cement to two parts of clean, sharp sand mixed dry. Add only sufficient water after mixing to give optimum consistency for placement. Do not use additives.

2.5 Pipe Bedding and Surround Materials

- .1 Refer to Section 31 05 16 – Aggregates: General.

2.6 Backfill Material

- .1 In accordance with Section 31 23 16 - Excavation, Trenching and Backfilling.

3 EXECUTION

3.1 Preparation

- .1 Clean and dry pipes and fittings before installation.
- .2 Obtain Contract Administrator's approval of pipes and fittings prior to installation.

3.2 Trenching

- .1 Do trenching work in accordance with Section 31 23 16 - Excavation, Trenching and Backfilling.
- .2 Do not allow contents of any sewer or sewer connection to flow into trench.
- .3 Trench alignment and depth require approval of Contract Administrator prior to placing bedding and pipe.

3.3 Concrete Bedding and Encasement

- .1 Do concrete work in accordance with Section 03 30 00 – Cast-In-Place Concrete.
- .2 Position pipe on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- .3 Do not backfill over concrete within 24 hours after placing.

Site Sanitary Sewerage Piping

3.4 Granular Bedding

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 98% Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D1557.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.5 Installation

- .1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Consultant.
- .2 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .3 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .4 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .5 Do not allow water to flow through pipe during construction.
- .6 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .7 Install plastic pipe and fittings in accordance with CSA B182.11.
- .8 Pipe jointing:
 - .1 Install gaskets in accordance with manufacturer's recommendations.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.

Site Sanitary Sewerage Piping

- .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
- .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.
- .6 Complete each joint before laying next length of pipe.
- .7 Minimize joint deflection after joint has been made to avoid joint damage.
- .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
- .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .9 When any stoppage of work occurs, block pipes to prevent creep during down time.
- .10 Plug lifting holes with pre-fabricated plugs, set in shrinkage compensating grout.
- .11 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .12 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available.
- .13 Use prefabricated saddles or field connections, for connecting pipes to existing sewer pipes. Joints to be structurally sound and watertight.

3.6 Pipe Surround

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, surround and cover pipes as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to underside of backfill to at least 98 % SPMDD in accordance with ASTM D1557.

3.7 Backfill

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to design grades.

Site Sanitary Sewerage Piping

- .3 Compact backfill to not less than 98 % SPMDD to ASTM D1557.
- .4 Place unshrinkable fill in accordance with Section 31 23 16 - Excavation, Trenching and Backfilling.

3.8 Service Connections

- .1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.
- .2 Service connections to main sewer.
- .3 Service connection pipe: shall not extend into interior of main sewer.
- .4 Make up required horizontal and vertical bends from 45bends or less, separated by straight section of pipe with minimum length of four pipe diameters. Use long sweep bends where applicable.
- .5 Plug service laterals with watertight caps or plugs.
- .6 Place location marker at ends of plugged or capped unconnected sewer lines. Each marker shall consist of 38 x 89 mm stake extending from pipe end at pipe level to 0.6 m above grade. Paint exposed portion of stake red with designation SAN SWR LINE in black.

3.9 Field Testing

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Draw tapered wooden plug or mandrel with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- .5 Do infiltration and exfiltration testing as specified herein.
- .6 Carry out tests on each section of sewer between successive manholes including service connections.
- .7 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.

Site Sanitary Sewerage Piping

- .8 Exfiltration test:
 - .1 Fill test section with water in such a manner as to allow displacement of air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are commenced.
 - .2 Immediately prior to test period add water to pipeline until there is a head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.
 - .3 Duration of exfiltration test: 2 hours.
 - .4 Water loss at end of test period: shall not exceed maximum allowable exfiltration over any section of pipe between manholes.
- .9 Infiltration test:
 - .1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.
 - .2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.
 - .3 Install watertight plug at upstream end of pipeline test section.
 - .4 Discontinue pumping operations for at least 3 days before test measurements are to commence and during this time, keep thoroughly wet at least one third of pipe invert perimeter.
 - .5 Prevent damage to pipe and bedding material due to flotation and erosion.
 - .6 Place 90V-notch weir, or other measuring device in invert of sewer at each manhole.
 - .7 Measure rate of flow over minimum of 1 hour, with recorded flows for each 5 min interval.
- .10 Leakage: shall not exceed following limits in litres per hour per mm of diameter per 100 m of sewer including service connections:
 - .1 Exfiltration, based on 600 mm head: 0.175 L.
 - .2 Infiltration: 0.150 L.
- .11 Repair and retest sewer line as required, until test results are within limits specified.
- .12 Repair visible leaks regardless of test results.

Site Sanitary Sewerage Piping

.13 CCTV Camera Inspections:

- .1 Carry out inspection of installed sewers by CCTV per OPSS 409. The video camera shall be a pan and tilt unit, making the inspection of lateral connections and a better view of deficiencies possible.
- .2 Acceptance of the work for the commencement of the maintenance guarantee period will take place only after the Consultant has accepted and approved the inspection report.

END OF SECTION

Foundation Drainage

PART 1 – GENERAL

1.1 Summary

- .1 Section includes:
 - .1 Perimeter weepers.
 - .2 Vertical drainage sheet.
 - .3 Geotextile filter cloth.

1.2 Submittals

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets: Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.

1.3 Quality Assurance

- .1 Qualifications:
 - .1 Installers:
 - .1 Shall have 5 years' experience, minimum, in application of *Products*, systems, and assemblies specified.

PART 2 - PRODUCTS

2.1 Materials

- .1 Geotextile filter cloth:
 - .1 Non-woven geotextile of polypropylene or polyester fibres, or combination of both.
 - .2 Weight: Minimum 136 g/m2 (4.0 oz/yd2), in accordance with ASTM D5261.
 - .3 Grab tensile strength: Minimum 445 N (120 Pound Force), in accordance with ASTM D4632/D4632M-15a.
 - .4 Water flow rate: Minimum 2460 l/min/m2 (60 gpm/ft2), in accordance with ASTM D4491/D4491M-20e1.
 - .5 Puncture: Minimum 180 N (41 Pound Force), in accordance with ASTM D4833/D4833M-08(2013)e1.
 - .6 Apparent Opening Size (AOS): Minimum 0.212 mm (0.008"), in accordance with ASTM D4751-20b.
 - .7 UV stability: 70% at 500 hours, in accordance with ASTM D4355/D4355M-14(2018).
 - .8 Acceptable *Products*:
 - .1 Tytar Geotextiles 'Tytar 3401'.
 - .2 Tencate Geosynthetics 'Mirafi 150N'.

Foundation Drainage

- .3 Terrafix Geosynthetics Inc. 'Terrafix 270R'.
- .2 Drainage weepers and fittings (weepers): 100 mm (4") minimum diameter, flexible high density polyethylene (HDPE), BNQ 3624-115-2016, fully perforated complete with one-piece geotextile filter sock, non-perforated at pass through transfer ports and connections to sump pits, weeper manufacturer's standard connector fittings, caps, and insert couplings.
 - .1 Acceptable *Products*:
 - .1 Armttec 'Big O Drain Tubing'.
 - .2 Substitutions: in accordance with Section 01 25 00.
 - .3 Vertical drainage sheet: Dimpled, high-impact resistant plastic core and attached filter fabric having width of 100 mm (4") wider than filter channel material, and of sufficient length to form 100 mm (4") end flap at top. Width of rolls: 1220 mm (48") minimum.
 - .1 Core material:
 - .1 Polystyrene.
 - .2 Acceptable *Products*:
 - .1 Carlisle Coatings & Waterproofing 'CCW MiraDRAIN 6000'.
 - .2 Grace 'Hydroduct 200'.
 - .3 Hydrotech 'Hydrodrain 400'.
 - .4 TerraFix Geosynthetics Inc. 'Terradrain 600'.
 - .5 'TREMDrain 1000' by Tremco Incorporated.
 - .6 W.R. Meadows 'Sealtight Mel-Drain 5035'.

PART 3- EXECUTION

3.1 Perimeter Weepers

- .1 Install weepers to the following minimum grade to outlets, unless otherwise indicated:
 - .1 0.0%.
- .2 Provide manufactured fittings, including cleanouts, to connect weepers.
- .3 Connect weepers to existing sump or existing outlet.
- .4 After quality control inspection, surround weepers with minimum of 150 mm (6") of drainage aggregate.
- .5 Wrap drainage aggregate with geotextile filter cloth. Overlap filter cloth joints minimum 200 mm (8").
- .6 Do not cover completed weeper installation until completion of quality control inspection.

3.2 Vertical Drainage Sheet

- .1 Install drainage sheets in accordance with manufacturer's instructions.

Foundation Drainage

- .2 Connecting adjacent sheet: Connect adjacent sheet at the longitudinal edge and sheet ends by pulling the filter fabric back to expose the flange. The sheet edge should be butted to the edge of the adjacent sheet dimple to dimple or the edge of the next panel may be placed over two dimples and interlocked. Connections in shingle fashion so that moisture will flow into lower sheet core. Overlap fabric in the direction of water flow. Cover terminal edges with the filter fabric flap by tucking in behind the core and if there is insufficient fabric, the core shall be cut out from the fabric by a depth of 3 dimples to provide excess fabric for wrapping the core.
- .3 Do not cover completed vertical drainage installation until completion of quality control inspection.

3.3 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.

END OF SECTION

Storm Sewers

1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 31 23 33 01 – Excavation Trenching and Backfilling.
- .2 Section 31 05 16 – Aggregates: General.
- .3 Section 03 30 00 – Cast-in-Place Concrete.

1.2 REFERENCES

- .1 ASTM C 14M-[95], Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe.
- .2 ASTM C 76M-[98], Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
- .3 ASTM C 117-[95], Standard Test Method for Material Finer Than 75 [MU] m (No. 200) Sieve in Mineral Aggregates by Washing.
- .4 ASTM C 136-[96a], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .5 ASTM C 428-[97], Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
- .6 ASTM C 443M-[98], Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric).
- .7 ASTM C 663-[98], Standard Specification for Asbestos Cement Storm Drain Pipe.
- .8 ASTM D 698-[91(1998)], Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m).
- .9 ASTM D 1869-[95], Standard Specification for Rubber Rings for Asbestos Cement Pipe.
- .10 ASTM D 2680-[95a], Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
- .11 ASTM D 3034-[98], Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and fittings.

Storm Sewers

- .12 ASTM D 3350-[98a], Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- .13 CAN/CGSB-8.1-[88], Sieves Testing, Woven Wire.
- .14 CAN/CGSB-8.2-[M88], Sieves Testing, Woven Wire, Metric.
- .15 CAN/CGSB-34.9-[M94], Pipe, Asbestos Cement, Sewer.
- .16 CAN/CSA-A5/A8/A362-[93], Portland Cement/Masonry Cement/Blended Hydraulic Cement.
- .17 CSA A60.1-[M1976], Vitrified Clay Pipe.
- .18 CSA A60.3-[M1976], Vitrified Clay Pipe Joints.
- .19 CAN/CSA-A257 Series-[M92], Standards for Concrete Pipe.
- .20 CAN/CSA-B70-[97], Cast Iron Soil Pipe, Fittings, and Means of Joining.
- .21 CAN/CSA-B182.1-[96], Plastic Drain and Sewer Pipe and Pipe Fittings.
- .22 CAN/CSA-B182.2-[95], PVC Sewer Pipe and Fittings (PSM Type).
- .23 CSA B182.6-[M98], Profile Polyethylene Sewer Pipe and Fittings.
- .24 CSA B182.11-[95], Recommended Practice for the Installation of Plastic Drain and Sewer Pipe and Pipe Fittings.
- .25 Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS), Region of Waterloo and Area Municipalities (Most Recent Edition) unless otherwise specified
- .26 City of Waterloo, Development Engineering Manual, and Construction Guidelines (Most Recent Edition) unless otherwise specified
- .27 OPSS 410 – Pipe Sewer Installation in Open Cut
- .28 OPSS 409 – Closed-Circuit Television Inspection

Storm Sewers

1.3 MATERIAL CERTIFICATION

- .1 Submit manufacturer's test data and certification at least 10 working days prior to commencing work.
- .2 Ensure certification is marked on pipe.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures, drawings shall be reviewed and approved prior to Construction.
- .2 Indicate proposed method for installing carrier pipe for undercrossings, if applicable.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures, samples shall be reviewed and approved prior to Construction. Any alternative products shall be approved in writing by Engineer prior to Construction.
- .2 Inform Contract Administrator at least 10 working days prior to commencing Work, of proposed source of bedding materials and provide access for sampling.
- .3 Submit to Contract Administrator for testing at least 10 working days prior to commencing work, following samples of materials proposed for use: Bedding materials, pipe surround, pipes, manholes, pipe connectors and adaptors.

1.6 SCHEDULING OF WORK

- .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
- .3 Notify Contract Administrator and Owner a minimum of 2 working days in advance of any interruption in service.

1.7 MANUFACTURERS INSTRUCTIONS

- .1 Make available 1 copy of manufacturer's installation instructions to Contract Administrator.

Storm Sewers

- .2 Submit manufacturers information data sheets and instructions in accordance with Section 01 33 00- Submittal Procedures.

1.8 SUSTAINABILITY REQUIREMENTS

- .1 This project shall apply sustainability principles in accordance with Section 01 36 00 LEED requirements.

1.9 MEASUREMENT AND PAYMENT

- .1 Include the following in the unit price bid of sewer installation;
 - .1 All necessary clearing and grubbing.
 - .2 Excavation to grade and disposal of excess material offsite in accordance with MOECC guidelines.
 - .3 Supply and installation of all pipes, fittings, bends, adaptors, reducers, specials sleeves, jointing, bedding, dewatering, shoring and bracing of trench supporting and protecting existing services, backfill and surface restoration.
 - .4 Field testing including deflection test, infiltration test and exfiltration test.
 - .5 CCTV camera inspection and support as per OPSS 409, including a compact disc (CD) of the inspection in a format acceptable to the Contract Administrator.
- .2 Payment for the connection to the existing sewer shall be based on unit price quoted per connection and include the following:
 - .1 Locating and exploring of existing pipes and manholes.
 - .2 Breaking into and re-benching of existing manholes including disposal of excess material offsite.
 - .3 Completing the connection by approved methods.

Storm Sewers

2 PRODUCTS

2.1 CONCRETE PIPE

- .1 Reinforced circular concrete pipe and fittings: to CAN/CSA-A257 and ASTM C 76M as indicated on the Contract Drawings, designed for flexible rubber gasket joints to CAN/CSA-A257 and ASTM C 443M.
 - .1 Acceptable suppliers: Hanson, Concast, Coldstream, Munro, Hyprescon, M-Con, Rainbow.
- .2 Lifting holes:
 - .1 Pipe 900 mm and less diameter - no lift holes.
 - .2 Pipe greater than 900 mm diameter - lift holes not to exceed two in a piece of pipe.
 - .3 Provide pre-fabricated plugs to effectively seal lift holes after installation of pipe.

2.2 PLASTIC PIPE

- .1 Type PSM Polyvinyl Chloride (PVC): to ASTM D 3034 CAN/CSA-B182.2.
 - .1 Standard Dimensional Ratio (SDR): 35
 - .2 Locked-in gasket and integral bell system
 - .3 Acceptable suppliers: IPEX, Rehau, Royal, Diamond Plastics
 - .4 City of Guelph does not accept profile PVC pipe (CSA 182.4)

2.3 SERVICE CONNECTIONS

- .1 Type PSM Poly (Vinyl) Chloride: to CAN/CSA-B182.2.
 - .1 Standard dimensional ration (SDR): 28
 - .2 Acceptable Suppliers: IPEX, Rehau, Royal, Diamond Plastics

Storm Sewers

2.4 CEMENT MORTAR

- .1 Portland cement: to CAN/CSA-A5/A8/A362, normal type 10.
- .2 Mix mortar one part by volume of cement to two parts of clean, sharp sand mixed dry. Add only sufficient water after mixing to give optimum consistency for placement. Do not use additives.

2.5 PIPE BEDDING AND SURROUND MATERIALS

- .1 Refer to applicable Contract Drawings.
- .2 Refer to Section 31 05 16 – Aggregates: General.

2.6 BACKFILL MATERIAL

- .1 In accordance with Section 31 23 16 - Excavation, Trenching and Backfilling.

3 EXECUTION

3.1 GENERAL

- .1 Note: Site Storm Sewage Piping shall terminate 1.5 m from building envelope and be stubbed, capped with a painted post brought to surface grade. Storm piping services tested as required external to the building and in accordance with DGMSS, OPSS and OBC requirements. Mechanical Contractor shall connect to the stub and bring it internally into the building as per Mechanical Contract Documents.

3.2 PREPARATION

- .1 Clean and dry pipes and fittings before installation.
- .2 Obtain Contract Administrators' approval of pipes and fittings prior to installation.

3.3 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 16 - Excavation, Trenching and Backfilling.
- .2 Do not allow contents of any sewer or sewer connection to flow into trench, provide bulkheads and plugs as required.

Storm Sewers

- .3 Trench alignment and depth require approval of Contract Administrator prior to placing bedding material and pipe.

3.4 CONCRETE BEDDING AND ENCASEMENT

- .1 Do concrete work in accordance with Section 03 33 00 - Cast-in-Place Concrete. Place concrete to details as indicated on Contract Drawings or as directed by the Contract Administrator.
- .2 Position pipe on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.
- .3 Do not backfill over concrete within 24 hours after placing.

3.5 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated by Geotechnical Report.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 98 % Standard Proctor Maximum Dry Density (SPMDD) in accordance with ASTM D1557.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.

3.6 INSTALLATION

- .1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Contract Administrator.
- .2 Handle pipe using methods approved by Contract Administrator. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

Storm Sewers

- .3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .6 Do not allow water to flow through pipe during construction, except as may be permitted by Contract Administrator.
- .7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CSA B182.11.
- .9 Pipe jointing:
 - .1 Install gaskets in accordance with manufacturer's recommendations.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and other foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.
 - .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
 - .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

Storm Sewers

- .10 When any stoppage of work occurs, block pipes as directed by Contract Administrator to prevent creep during down time.
- .11 Plug lifting holes with pre-fabricated plugs approved by Contract Administrator, set in shrinkage compensating grout.
- .12 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Make watertight connections to manholes. Use shrinkage compensating grout when suitable gaskets are not available.
- .14 Use prefabricated saddles or field connections approved by Contract Administrator, for connecting pipes to existing sewer pipes. Joints to be structurally sound and watertight.

3.7 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Contract Administrator has inspected pipe joints, surround and cover pipes as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to spring line of pipe to at least 98 % SPMDD in accordance with ASTM D1557.
- .6 Compact each layer from spring line of pipe to underside of backfill to at least 98 % SPMDD in accordance with ASTM D1557.

3.8 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

Storm Sewers

- .3 Under paving and walks, compact backfill to not less than 98 % SPMDD in accordance with ASTM D1557.. In other areas, backfill may be compacted to at least 95 % Standard Proctor Density (SPD) in accordance with ASTM D 698.
- .4 Place unshrinkable fill in accordance with Section 31 23 33 01 - Excavation, Trenching and Backfilling].

3.9 UNDERCROSSING

- .1 Submit shop drawings showing proposed method of installation in accordance with Section 01 33 00 – Substantial Procedures.
- .2 Excavate working pit to dimensions indicated.
- .3 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pit.
- .4 Dewater excavation.
- .5 Dewater area of undercrossing.
- .6 Install heavy timber backstop.
- .7 Place encasing pipe to exact line and grade as indicated.
- .8 Install encasing pipe by jacking and boring or tunneling.
- .9 Ensure encasing pipe is not in tension.
- .10 Use welded type joints for encasing pipe.
- .11 Place concrete grout levelling pad in encasing pipe. Carefully control level of grout during placing.
- .12 Insert storm sewer pipe into encasement pipe, in end with largest opening after placement of leveling pad.
- .13 Use approved blocking method to guide storm sewer pipe in true alignment.
- .14 Clearance between blocks and encasement pipe: maximum 12 mm when storm sewer pipe is in position.
- .15 Join storm sewer pipe one length at time outside encasement pipe. Push storm sewer pipe into position.

Storm Sewers

- .16 Couplings of storm sewer pipe: not to rest on levelling pad when storm sewer pipe is in position.
- .17 Place concrete cradle around storm sewer pipe after it is positioned. Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.
- .18 Pressure grout remaining void with grout consisting of one part Portland cement and two parts clean washed sand with only sufficient amount of water added to allow placement. Do not install pressure grout until storm sewer pipe is secure against flotation. Do not use additives.
- .19 Do field testing before placing concrete cradle and grouting.

3.10 SERVICE CONNECTIONS

- .1 Install pipe to CSA B182.11 and manufacturer's instructions and specifications.
- .2 Maintain grade for service connections at 1 vertical to 50 horizontal unless directed otherwise by Contract Administrator.
- .3 Service connections to main sewer: as shown on Contract Drawings.
- .4 Service connection pipe: not to extend into interior of main sewer.
- .5 Make up required horizontal and vertical bends from 45° bends or less, separated by straight section of pipe with minimum length of four pipe diameters. Use long sweep bends where applicable.
- .6 Plug service laterals with water tight caps or plugs as approved by Contract Administrator.
- .7 Place location marker at ends of plugged or capped unconnected sewer lines. Each marker shall consist of 38 x 89 mm stake extending from pipe end at pipe level to 1.0 m above grade. Paint exposed portion of stake red with designation STM SWR LINE in green.

3.11 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Contract Administrator, draw tapered wooden plug or mandrel with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction as per OPSS 410.

Storm Sewers

- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
- .5 Do infiltration and exfiltration testing as specified herein and as directed by Contract Administrator. Perform tests in presence of Contract Administrator. Notify Contract Administrator 24 hours in advance of proposed tests as per OPSS 401.
- .6 Carry out tests on each section of sewer between successive manholes including service connections.
- .7 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.
- .8 Exfiltration test: (OPSS 410)
 - .1 Fill test section with water in such a manner as to allow displacement of air in line. Maintain under nominal head for 24 hours to ensure absorption in pipe wall is complete before test measurements are commenced.
 - .2 Immediately prior to test period add water to pipeline until there is a head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.
 - .3 Duration of exfiltration test: 2 hours.
 - .4 Water loss at end of test period: not to exceed maximum allowable exfiltration over any section of pipe between manholes.
- .9 Infiltration test: (OPSS 410)
 - .1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.
 - .2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.
 - .3 Install watertight plug at upstream end of pipeline test section.

Storm Sewers

- .4 Discontinue pumping operations for at least 3 days before test measurements are to commence and during this time, keep thoroughly wet at least one third of pipe invert perimeter.
- .5 Prevent damage to pipe and bedding material due to flotation and erosion.
- .6 Place 90V-notch weir, or other measuring device approved by Contract Administrator in invert of sewer at each manhole.
- .7 Measure rate of flow over minimum of 1 hour, with recorded flows for each 5 min interval.
- .10 Leakage: not to exceed following limits in litres per hour per mm of diameter per 100 m of sewer including service connections:
 - .1 Exfiltration, based on 600 mm head: 0.175 L.
 - .2 Infiltration: 0.150 L.
- .11 Repair and retest sewer line as required, until test results are within limits specified.
- .12 Repair visible leaks regardless of test results.
- .13 CCTV Camera Inspections:
 - .1 Carry out inspection of installed sewers by CCTV per OPSS 409. The video camera shall be a pan and tilt unit, making the inspection of lateral connections and a better view of deficiencies possible.
 - .2 Provide means of access to permit Contract Administrator to do inspections.
 - .3 Acceptance of the work for the commencement of the maintenance guarantee period will take place only after the Contract Administrator has accepted and approved the inspection report.

END OF SECTION