

# **PROJECT MANUAL - Volume 1**

**Architectural, Civil, Commissioning, Landscape, and Structural Specifications**

Issued for Tender

## **East Hants Aquatic Centre** **East Hants, Nova Scotia**

### **MacLennan Jaunkalns Miller Architects**

425 Adelaide Street West, Level 6  
Toronto, Ontario  
M5V 3C1

Tel: 416-593-6796

Fax: 416-593-0212

### **TEAL Architects+Planners Inc.**

1660 Hollis Street, Suite 1101  
Halifax, Nova Scotia  
B3J 1V7

Tel: 902-404-8383

Fax: 902-404-8368

Project No. RFC50186

March 1, 2018

Document Responsibility and Project Directory

---

## 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 Cx - Denotes documents prepared by Commissioning Consultant.
  - .4 E - Denotes documents prepared by Electrical Engineer.
  - .5 G - Denotes documents prepared by Geotechnical Consultant.
  - .6 L - Denotes documents prepared by Landscape Architect.
  - .7 M - Denotes documents prepared by Mechanical Engineer.
  - .8 O - Denotes documents prepared by Owner.
  - .9 S - Denotes documents prepared by Structural Engineer.
- .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 With regard to Section 00 31 00: The architect's seal governs only Section 00 31 00 proper, and not the documents listed therein.

## 1.2 Project Directory

- .1 Owner:

**The Municipality of East Hants**

Lloyd E Matheson Centre  
230-15 Commerce Court  
Elmsdale, Nova Scotia  
B2S 3K5

Tender Contact: Michael Hatfield

.2 Architects in Association (the *Consultant*):

**MacLennan Jaunkalns Miller Architects**

425 Adelaide Street West, Level 6  
Toronto, Ontario  
M5V 3C1

Tel: 416-593-6796

Fax: 416-593-0212

**TEAL Architects+Planners Inc.**

1660 Hollis Street, Suite 1101  
Halifax, Nova Scotia  
B3J 1V7

Tel: 902-404-8383

Fax: 902-404-8368

.3 Structural Engineer:

**Campbell Comeau Engineering**

2719 Gladstone Street, #110  
Halifax, Nova Scotia  
B3K 4W6

Tel: 902-429-5454

.4 Mechanical Engineer:

**Smith and Andersen Consulting Engineering**

4211 Yonge Street, Suite 500  
Toronto, Ontario  
M2P 2A9

Tel: 416-487-8151

Fax: 416-487-9104

.5 Electrical Engineer:

**Smith and Andersen Consulting Engineering**

4211 Yonge Street, Suite 500  
Toronto, Ontario  
M2P 2A9

Tel: 416-487-8151

Fax: 416-487-9104

.6 Civil Engineer:

**Strum Consulting**  
1355 Bedford Hwy  
Bedford, Nova Scotia  
B4A 1C5

Tel: 902-835-5560

.7 Landscape Architect:

**MacLennan Jaunkalns Miller Architects**  
425 Adelaide Street West, Level 6  
Toronto, Ontario  
M5V 3C1

Tel: 416-593-6796  
Fax: 416-593-0212

.8 Geotechnical Consultant:

**Conquest Engineering**  
348 Bluewater Road  
Bedford, Nova Scotia  
B4B 1J6

Tel: 902-835-7313

.9 Commissioning Consultant:

**Stantec**  
102-40 Highfield Park Drive  
Dartmouth, Nova Scotia  
B3A 0A3

Tel: 902-468-7777

**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>
<b>VOLUME 1</b>			
<b>INTRODUCTORY INFORMATION</b>			
00 01 05 Document Responsibility and Project Directory.....	A	3	March 1, 2018
00 01 10 Table of Contents .....	A	5	March 1, 2018
00 21 13 Instructions to Bidders .....	A	13	March 1, 2018
00 31 00 Information Available for Review.....	A	1	March 1, 2018
00 41 13 Stipulated Price Bid Form .....	A	3	March 1, 2018
00 43 23 Alternative Prices Bid Form Supplement.....	A	1	March 1, 2018
00 73 00 Amendments to CCDC 2 – 2008.....	A	11	March 1, 2018
<b>DIVISION 01 - GENERAL REQUIREMENTS</b>			
01 10 00 General Instructions.....	A	7	March 1, 2018
CAD Disclaimer .....	A	1	March 1, 2018
BIM Disclaimer.....	A	2	March 1, 2018
01 25 00 Product Substitution Procedures.....	A	2	March 1, 2018
01 26 00 Requests for Interpretation.....	A	2	March 1, 2018
RFI Form .....	A	1	March 1, 2018
01 31 13 Coordination .....	A	2	March 1, 2018
01 31 19 Project Meetings .....	A	6	March 1, 2018
01 32 16 Construction Progress Documentation.....	A	2	March 1, 2018
01 32 33 Photographic Documentation.....	A	1	March 1, 2018
01 33 00 Submittals.....	A	9	March 1, 2018
01 42 13 Acronyms and Abbreviations .....	A	5	March 1, 2018
01 45 00 Quality Control .....	A	7	March 1, 2018
01 50 00 Temporary Facilities and Controls.....	A	9	March 1, 2018
01 60 00 Product Requirements .....	A	7	March 1, 2018
01 73 29 Cutting and Patching.....	A	3	March 1, 2018
01 74 13 Progressive Cleaning.....	A	1	March 1, 2018
01 77 00 Contract Closeout Procedures and Submittals.....	A	9	March 1, 2018
01 78 36 Extended Warranties .....	A	1	March 1, 2018
01 91 13 General Commissioning Requirements.....	Cx	13	March 1, 2018
01 91 31 Commissioning Plan .....	Cx	21	March 1, 2018
01 91 41 Commissioning Training .....	Cx	3	March 1, 2018
<b>DIVISION 03 - CONCRETE</b>			
03 10 00 Concrete Formwork and Falsework .....	S	2	March 1, 2018
03 15 20 Integral Crystalline Waterproofing			
– Hydrostatic Conditions .....	A	5	March 1, 2018
03 20 00 Concrete Reinforcement.....	S	3	March 1, 2018
03 30 00 Cast-In-Place Concrete.....	S	9	March 1, 2018

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>
03 35 00 Concrete Floor Finishing.....	A	5	March 1, 2018
03 41 00 Precast Structural Concrete .....	S	4	March 1, 2018
03 48 00 Architectural Precast Concrete Fabrications .....	A	4	March 1, 2018
<b>DIVISION 04 - MASONRY</b>			
04 05 00 Masonry Procedures.....	A	9	March 1, 2018
04 05 13 Mortar and Grout for Masonry .....	A	2	March 1, 2018
04 05 19 Masonry Reinforcement and Connectors .....	A	2	March 1, 2018
04 05 23 Masonry Accessories.....	A	3	March 1, 2018
04 22 00 Concrete Masonry Units .....	A	2	March 1, 2018
<b>DIVISION 05 - METALS</b>			
05 12 00 Structural Steel .....	S	6	March 1, 2018
05 21 00 Steel Joists .....	S	2	March 1, 2018
05 31 00 Steel Deck .....	S	3	March 1, 2018
05 41 13 Lateral Load-Bearing Cold-Formed Metal Framing .....	A	5	March 1, 2018
05 50 00 Metal Fabrications .....	A	7	March 1, 2018
05 50 01 Miscellaneous Metals Fabrication Schedule .....	A	4	March 1, 2018
<b>DIVISION 06 - WOOD, PLASTIC, AND COMPOSITES</b>			
06 10 53 Rough Carpentry .....	A	4	March 1, 2018
06 15 10 Nail Laminated Timber .....	S	4	March 1, 2018
06 18 00 Cross-Laminated Construction.....	S	5	March 1, 2018
06 40 00 Architectural Woodwork .....	A	13	March 1, 2018
06 40 13 Exterior Architectural Woodwork .....	A	3	March 1, 2018
<b>DIVISION 07 - THERMAL AND MOISTURE PROTECTION</b>			
07 11 13 Bituminous Dampproofing.....	A	2	March 1, 2018
07 13 26 Self-Adhering Sheet Waterproofing.....	A	5	March 1, 2018
07 18 13 Service Room Traffic Coatings .....	A	5	March 1, 2018
07 19 28 Graffiti Protection Sealer.....	A	3	March 1, 2018
07 21 00 Thermal Insulation .....	A	5	March 1, 2018
07 21 01 Insulation Types Schedule .....	A	2	March 1, 2018
07 26 16 Below-Grade Vapour Barrier.....	A	3	March 1, 2018
07 27 00 Air Barrier Systems.....	A	7	March 1, 2018
07 46 16 Aluminum Panel Cladding System .....	A	9	March 1, 2018
07 46 19 Metal Cladding Systems .....	A	9	March 1, 2018
07 46 23 Wood Soffits .....	A	5	March 1, 2018
07 54 19 Polyvinyl-Chloride (PVC) Roofing .....	A	12	March 1, 2018
07 84 00 Joint Firestopping and Smoke Seals.....	A	6	March 1, 2018
07 92 00 Joint Sealants .....	A	8	March 1, 2018

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>
<b>DIVISION 08 - OPENINGS</b>			
08 11 13 Steel Doors and Frames .....	A	12	March 1, 2018
08 14 00 Flush Wood Doors .....	A	6	March 1, 2018
08 33 26 Overhead Coiling Grilles .....	A	3	March 1, 2018
08 33 36 Side Coiling Grilles.....	A	3	March 1, 2018
08 42 26 Glass Partitions.....	A	5	March 1, 2018
08 44 00 Aluminum Framed Glazing Systems .....	A	20	March 1, 2018
08 71 00 Door Hardware .....	H	15	March 1, 2018
08 71 13 Automatic Door Operators .....	A	4	March 1, 2018
08 80 00 Glass and Glazing .....	A	13	March 1, 2018
08 87 00 Applied Films .....	A	2	March 1, 2018
08 91 19 Louvres.....	A	5	March 1, 2018
<b>DIVISION 09 - FINISHES</b>			
09 22 00 Metal Supports for Gypsum and Cement Board.....	A	10	March 1, 2018
09 29 00 Gypsum and Cement Board.....	A	17	March 1, 2018
09 29 01 Interior Gypsum and Cement Board Schedule .....	A	1	March 1, 2018
09 31 00 Tiling .....	A	13	March 1, 2018
09 31 01 Tiling Schedule .....	A	3	March 1, 2018
09 51 23 Acoustical Tile Ceiling Systems .....	A	6	March 1, 2018
09 64 23 Wood Flooring .....	A	5	March 1, 2018
09 65 13 Premanufactured Bases .....	A	5	March 1, 2018
09 67 00 Fluid-Applied Floor and Wall Coatings .....	A	4	March 1, 2018
09 78 13 Metal Interior Panelling .....	A	4	March 1, 2018
09 91 00 Painting.....	A	16	March 1, 2018
09 91 01 Paint Systems and Anti-Corrosion Schedule.....	A	3	March 1, 2018
09 96 13 High Performance Paint Coatings.....	A	9	March 1, 2018
<b>DIVISION 10 - SPECIALTIES</b>			
10 14 00 Signage .....	A	9	March 1, 2018
10 21 13 Solid Phenolic Partitions .....	A	4	March 1, 2018
10 22 27 Operable Glass Partitions .....	A	5	March 1, 2018
10 28 00 Washroom Accessories .....	A	3	March 1, 2018
10 28 01 Washroom Accessories Schedule.....	A	2	March 1, 2018
10 51 13 Prefinished Metal Lockers.....	A	3	March 1, 2018
10 51 26 Solid Phenolic Lockers.....	A	3	March 1, 2018
<b>DIVISION 11 - EQUIPMENT</b>			
11 14 13 Pedestrian Control Systems.....	A	3	March 1, 2018
11 52 13 Projection Screens.....	A	2	March 1, 2018
11 52 15 Television Mounts.....	A	2	March 1, 2018
11 70 00 Patient Lift.....	A	4	March 1, 2018

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>
<b>DIVISION 12 - FURNISHINGS</b>			
12 24 13 Roller Window Shades.....	A	4	March 1, 2018
12 48 16 Entrance Floor Mats.....	A	2	March 1, 2018
12 93 13 Site Furnishings .....	A	2	March 1, 2018
<b>DIVISION 13 - SPECIAL CONSTRUCTION</b>			
13 11 12 Splash Pad .....	A	10	March 1, 2018
13 11 13 Swimming Pool Tanks and Decks.....	A	13	March 1, 2018
13 11 14 Swimming Pool Tanks Meeting Agenda.....	A	6	March 1, 2018
13 11 20 Swimming Pool Tiling.....	A	13	March 1, 2018
13 11 21 Pool Tiling Schedule .....	A	3	March 1, 2018
13 11 46 Swimming Pool Accessories .....	A	5	March 1, 2018
13 11 47 Pool Accessories Schedule.....	A	4	March 1, 2018
13 14 13 Pool Waterslide.....	A	5	March 1, 2018
<b>DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)</b>			
23 08 00 Commissioning Requirements – Mechanical.....	Cx	26	March 1, 2018
<b>DIVISION 26 – ELECTRICAL</b>			
26 08 00 Commissioning Requirements – Electrical .....	Cx	7	March 1, 2018
<b>DIVISION 31 - EARTHWORK</b>			
31 11 00 Clearing and Grubbing.....	C	2	March 1, 2018
31 15 53 Erosion and Sediment Control .....	C	2	March 1, 2018
31 22 19 Topsoil and Finish Grading .....	A	3	March 1, 2018
31 23 33 Excavating, Trenching, and Backfilling.....	C	12	March 1, 2018
31 29 19 Geotextiles.....	C	4	March 1, 2018
<b>DIVISION 32 - EXTERIOR IMPROVEMENTS</b>			
32 01 90 Temporary Tree and Plant Protection .....	A	4	March 1, 2018
32 11 16 Granular Subbase.....	C	2	March 1, 2018
32 11 23 Aggregate Base Course.....	C	3	March 1, 2018
32 12 16 Asphalt Concrete Paving .....	C	5	March 1, 2018
32 14 40 Landscape Stone Boulders.....	A	2	March 1, 2018
32 15 40 Decorative Landscape Riverstone .....	A	2	March 1, 2018
32 16 15 Concrete Walks, Curbs, and Gutters.....	C	4	March 1, 2018
32 16 16 Exposed Aggregate Concrete Paving .....	C	6	March 1, 2018
32 17 23 Pavement Markings .....	C	2	March 1, 2018
32 17 24 Thermoplastic Pavement Markings .....	A	2	March 1, 2018
32 18 16 Playground Surfacing.....	A	2	March 1, 2018
32 90 00 Planting.....	A	14	March 1, 2018
32 92 20 Grass Seeding (Hydraulic) .....	A	3	March 1, 2018
32 98 00 Reinstatement.....	C	3	March 1, 2018

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>
<b>DIVISION 33 - UTILITIES</b>			
33 11 16 Site Water Utility Distribution Piping.....	C	12	March 1, 2018
33 31 13 Public Sanitary Utility Sewerage Piping.....	C	8	March 1, 2018
33 39 00 Precast Manholes, Catch Basins, and Structures .....	C	5	March 1, 2018
33 41 00 Storm Utility Drainage Piping .....	C	7	March 1, 2018
33 46 13 Foundation Drainage .....	A	3	March 1, 2018

## VOLUME 2

### INTRODUCTORY INFORMATION

00 01 01 Project Manual Title Page .....	A	1	March 1, 2018
--	---	---	---------------

### **DIVISIONS 21, 22, AND 23**

Refer to Mechanical for index.....	M
------------------------------------	---

### **DIVISION 26, 27, AND 28**

Refer to Electrical for index .....	E
-------------------------------------	---

**END OF SECTION**

Instructions to Bidders

---

## **PART 1 - GENERAL**

### **1.1 General**

- .1 Name of *Owner*: The Municipality of the District of East Hants.
- .2 *Bidder*: is defined as the company submitting a bid to the *Owner* in response to the *Owner's* invitation to bid.
- .3 Tender Contact: the Tender Contact is Michael Hatfield, email address [mhatfield@easthants.ca](mailto:mhatfield@easthants.ca).
- .4 Brief description of the *Work*: A new fitness and recreation facility of 2,662 square metres accommodating a six-lane 25 metre pool, a leisure body of water with ramp access, a lazy-river-resistance moving-water pool, a hot pool with a capacity of between 15 and 20 persons, an internal waterslide, and a multi-purpose room for family and community gatherings, complete with supporting infrastructure and sitework.

### **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 Section 00 43 23 Alternative Prices Bid Form Supplement.
  - .5 Addenda issued prior to *Bid Closing Time*.
  - .6 Agreement between *Owner* and *Contractor* in the form of CCDC 2 - 2008.
  - .7 Definitions given in CCDC 2 - 2008.
  - .8 General Conditions of CCDC 2 - 2008.
  - .9 Section 00 73 00 - Amendments to CCDC 2 – 2008.
  - .10 Specifications as listed in Section 00 01 10 of the project manual for this project.
  - .11 Schedules as listed in Section 00 01 10 of the project manual and as listed in the list of drawings.
  - .12 Drawings as listed in the list of drawings given on Drawing A000.

### **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 - 2008.
  - .3 Definitions given in CCDC 2 - 2008.
  - .4 General Conditions of CCDC 2 - 2008.
  - .5 Section 00 73 00 - Amendments to CCDC 2 – 2008.

Instructions to Bidders

---

- .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 Drawing A000.

#### 1.4 Location for Receiving Bids and *Bid Closing Time*

- .1 Location for receiving bids:
  - .1 Bids shall be received by the *Owner* at or before the *Bid Closing Time* at the following location:
    - .1 Municipality of East Hants, Box 230, Suite 170, Lloyd E. Matheson Centre, 15 Commerce Court, Elmsdale, NS, B2S 3K5, Attention: RFC50186, Tender Contact: Michael Hatfield.
  - .2 Bids must be received at the Reception & Payments counter in Suite 170, and must have the time and date indicated on it by the *Owner's* staff to confirm receipt prior to the stated *Bid Closing Time*. Please allow sufficient time to be served by staff.
  - .3 When sending by courier or other means where the label may be obscured, the *Bidder* must ensure the competition number / project number (RFC50186) appears on the outer packaging.
- .2 *Bid Closing Time*:
  - .1 The *Bid Closing Time* is defined as the time and date at or before which bids shall be received by the *Owner*, namely:
    - .1 At or before 3:00:00 pm local time, as determined by the clock located in location for receiving bids on the 5<sup>th</sup> day of April, 2018.
  - .2 Any bid received after 3:00:00 pm local time on the 5<sup>th</sup> day of April, 2018, will be declared a bid received after the *Bid Closing Time*.

#### 1.5 Public Bid Opening

- .1 A public bid opening will be held following the *Bid Closing Time*.
- .2 The location and time for the bid opening are as follows:
  - .1 Location: Lloyd E. Matheson Centre, Council Chambers.
  - .2 Time: approximately 3:05 pm local time.
- .3 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.
- .4 In the event that more than one envelope is received from the same *Bidder* for the main bid, the envelope bearing the latest time and date mark prior to the *Bid Closing Time* will be considered the intended bid and any other envelopes received from the same *Bidder* will be returned unopened.

Instructions to Bidders

---

## 1.6 Bid Submission Requirements

- .1 Bids must be received by the *Owner* at or before the *Bid Closing Time*.
  - .1 *Bidders* shall submit their bids as one original copy. Do not return *Bid Documents* with the bid, except forms as explicitly required to be submitted in accordance with the *Bid Documents*.
- .2 Bids will be time and date marked upon receipt at the location specified for receipt of bids. The *Bidder* shall be solely responsible for verifying that its bid is time and date marked.
  - .1 *Bidders* shall be solely responsible for delivering their bids sufficiently in advance of the *Bid Closing Time* to permit time and date marking to happen.
- .3 Bids shall be submitted in sealed envelopes clearly labelled as follows:
  - .1 "RFC50186 Bid for East Hants Aquatic Centre".
- .4 Bids must be submitted on Section 00 41 13 and prescribed bid form supplements, as required, furnished with *Bid Documents*. Fill-in blanks on such documents and forms.
- .5 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*.
- .6 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.
- .7 Bids submitted must be signed and sealed. Incorporated companies shall affix their corporate seal and have bid signed by their duly authorized officers.
- .8 Bids must not be restricted by a covering letter, a statement added, or by alterations not called for. Bids containing such restrictions may be rejected.
- .9 Each bid shall include a completed Section 00 41 13, 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.
- .10 In no event will the *Owner* be responsible for any costs incurred by anyone in the preparation and/or submission of a bid, including costs for printing copies of the *Bid Documents*.
- .11 By submitting a bid, a *Bidder* agrees to each and every of the terms, provisions and conditions set out in the *Bid Documents*.
- .12 *Bidders* must be in or become in Good Standing with the Workers' Compensation Board of Nova Scotia (WCBNS) in order to be eligible to complete the *Work*. If the *Bidder* is normally exempt from coverage under the Workers' Compensation Act, NS, they will be required to obtain such coverage for the duration of the *Work*. Failure to obtain coverage prior to starting the *Work*, for any reason, will result in the award being terminated.

Instructions to Bidders

---

- .13 *Bidders* shall be required to carry, and shall provide proof of coverage to the Municipality of East Hants, as and when requested, the type and amounts of insurance specified in Canadian Standard Construction Contract CCDC 2 – 2008, stipulated price contract, GC 11 INSURANCE AND CONTRACT SECURITY, and any Supplementary Conditions specified in the *Contract Documents*. Failure to obtain the required insurance prior to starting the *Work* are grounds for cancelling award.
- .14 Municipality of East Hants cannot, and by this bid does not, agree to indemnify, hold harmless, exonerate or assume the defence of the *Bidder* and *Contractor* or any other person or entity whatsoever, for any purpose whatsoever.
- .15 *Bidders* shall indemnify and hold harmless the Municipality of the District of East Hants, its officers, members of municipal council, employees and volunteers from and against any liabilities, claims, expenses, demands, loss, cost, damages, actions, suits or other proceedings made, sustained, brought, prosecuted or threatened to brought or prosecuted that are based upon, occasioned by or attributed to any bodily injury to or death of a person or damage to or loss of property caused by any acts or omissions on the part of the Contractor, its officers, employees, students, agents, volunteers or those for whom they are responsible arising out of this Tender or any resulting Contract.

#### **1.7 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 *Owner*, to the attention of the Tender Contact: Michael Hatfield by hard-copy.
  - .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.

#### **1.8 *Bidder* Inquiries and Issuance of Addenda**

- .1 Questions concerning the *Bid Documents* are to be sent by email to the Owner, to the attention of Michael Hatfield at [mhatfield@easthants.ca](mailto:mhatfield@easthants.ca). The *Bidder* is solely responsible to ensure their question or comment has been received.
- .2 The *Owner* will issue responses to questions, where appropriate, by addenda.
- .3 Questions received later than 3:00 pm, local time, on the 21<sup>st</sup> day of March, 2018, may not be answered by addenda.
- .4 Addenda will be issued no later than 4:30 pm, local time, on the 27<sup>th</sup> day of March, 2018, subject to paragraph 1.8.6 of Section 00 21 13.
- .5 *Bidders* shall notify *Owner*, in writing prior to the deadline for receipt of questions, of the following:
  - .1 Discrepancies or omissions found in the *Bid Documents*.

Instructions to Bidders

---

- .2 Clarifications required regarding the meaning of requirements contained in the *Bid Documents*.
- .6 The *Owner* reserves the right to amend the *Contract Documents* at any time for any reason prior to the *Bid Closing Time* by way of written addenda. Clarification and corrections of discrepancies or omissions will be made through addenda only. In the event an addendum must be issued within 2 days of the *Bid Closing Time*, the *Bid Closing Time* will be adjusted to allow *Bidders* time to review the addendum prior to submitting their bid.
- .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.

## 1.9 Bonding Requirements

- .1 Bonds shall be issued by a bonding company acceptable to *Owner* and licensed to issue such instruments in the Province of Nova Scotia.
- .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:
  - .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 Nova Scotia, 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.

Instructions to Bidders

---

.2 Labour and material payment bond:

.1 Amount: 50% of the bid price.

.2 The agreement to bond shall be valid for *Bid Acceptance Period*.

.4 Costs for bonds are included in the stipulated price bid.

**1.10 The *Bid Acceptance Period***

.1 The *Bid Acceptance Period* is defined as a period of up to, and including, 60 days, commencing at the *Bid Closing Time*, during which bids shall be irrevocable and open to acceptance by *Owner*.

**1.11 Pre-Bid Meeting**

.1 *Bidders* are invited to attend a pre-bid meeting at 10:30 am, local time, on the 8<sup>th</sup> day of March, 2018, in Room 168 in the Lloyd E. Matheson Centre, 15 Commerce Court, Elmsdale, NS, B2S 3K5. Attendance is not mandatory.

**1.12 Bid Documents Availability**

.1 Complete sets of *Bid Documents* shall be issued by the *Owner* electronically through the Municipality of East Hants procurement application at no charge. Hard copy sets will not be made available by the *Owner*.

**1.13 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*.

**1.14 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 *Owner* 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.

.1 Unscheduled visits shall be at visitor's own and sole risk.

Instructions to Bidders

---

- .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, entirely at the *Bidder's* own risk.
- .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*, nor for existing conditions noted in Section 00 31 00.

**1.15 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 *Owner's* prior acceptance in writing.
- .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 *Owner* 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 *Owner* may, with agreement in writing from the *Consultant* and where there is no additional cost to the *Owner* to do so, accept a more readily available *Product*.

**1.16 Bid Form Supplements**

- .1 The following bid form supplements form an integral part of Section 00 41 13:
  - .1 Section 00 43 23 Alternative Prices Bid Form Supplement.
- .2 Bid form supplements shall be delivered in the same envelope as Section 00 41 13.
- .3 Bid form supplements shall be signed, sealed, and dated in the same manner as Section 00 41 13.
- .4 The requirements for completing bid form supplements, and the effect that the bid form supplements will have in the evaluation of bids, shall be as described hereunder.
- .5 Section 00 43 23 Alternative Prices Bid Form Supplement:
  - .1 *Bidders* shall make an entry against each alternative price listed. The amount to be added to, or deducted from, the bid price shall be entered for each alternative requested.

Instructions to Bidders

---

- .2 The alternative prices bid shall be inclusive of costs of carrying out the *Work* described in accordance with the applicable parts of the *Contract Documents*, and shall include the costs of all *Products*, materials, labour, equipment, delivery, storage, handling, statutory charges, overhead and profit, other related charges, and shall include 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* affected by the alternative price.
- .3 Alternatives and alternative prices shall be open for acceptance by the *Owner* for the duration of the *Bid Acceptance Period* and for the duration of the resulting *Contract*.
- .4 The *Work* of the *Contract* and the *Contract Price* will reflect the alternatives and alternative prices, if any, accepted by the *Owner* at the time of *Contract* award.
- .5 Acceptance of any alternatives will not affect the *Contract Time*, unless *Bidders* have specifically indicated an increase or decrease in time, in number of days, on account of a particular alternative in their bid.
- .6 The *Owner* shall have the right to accept any of the alternatives and corresponding alternative prices in any order or combination, including all or none.
- .7 Alternative prices may be considered in determining the most appropriate *Bidder*.

**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 proposals at least 10 *Working Days* prior to the *Bid Closing Time* to allow for review, and for incorporation into an addendum, if accepted.
- .2 The *Owner* will not necessarily accept alternatives proposed by *Bidder*.

**1.18 Owner's Budget**

- .1 In the event the bid prices exceed the estimated price budgeted to complete the *Work*, the Municipality of East Hants may, in its sole discretion, utilize one or more of the methods specified in the Construction Contract Guidelines, Nova Scotia, 2006, section CCG 41 Effect of Bids Higher than the Estimated Contract Value in determining a way to proceed.

**1.19 Award of Contract**

- .1 Bid analysis and evaluation:
  - .1 The Municipality of East Hants does not bind itself to accept any Tender, but may accept any Tender, in whole or in part, or discuss with any Tenderer different or additional terms to those described in the Tender documents or in such Tenderer's Tender. The Municipality of East Hants may:
    - .1 reject any or all of the Tenders;
    - .2 accept any Tender;
    - .3 if only one Tender is received, choose to accept or reject it;
    - .4 not to accept the lowest bid price; or

Instructions to Bidders

---

- .5 alter the schedule, process, or any other aspect of the Tender, as it may determine in its sole and absolute discretion.
- .2 The *Owner* reserves the right to include for consideration, and may award the *Contract* to a *Bidder* submitting, a bid that is substantially compliant with the terms and conditions of the *Bid Documents*. Bids that are non-compliant will not be considered by the *Owner*.
  - .1 Bids containing errors or omissions not listed under paragraph 1.19.1.4 will be declared substantially compliant.
- .3 In determining the most appropriate bid, the criteria considered by the *Owner* will include, but will not be limited to, the following (in no particular order):
  - .1 Bid price.
  - .2 Alternative Prices.
- .4 Bids containing the following errors or omissions, in no particular order, will be declared non-compliant:
  - .1 Bid received after the *Bid Closing Time* (which bids will be returned unopened).
  - .2 Bid not received in hard copy at the location prescribed for the receipt of bids by the *Bid Documents*.
  - .3 Bid received by fax, by email, or by any other electronic means.
  - .4 Bid not submitted in sealed envelope (whether envelope was provided by *Owner* or by *Bidder*).
  - .5 Bid does not include bid bond in form and amount prescribed by the *Bid Documents*.
  - .6 Bid does not contain agreement to bond in form and amount prescribed by the *Bid Documents*.
  - .7 Bid where evidence of collusion, intent to defraud, or illegal practices on the part of a *Bidder* is presented or discovered.
  - .8 Bid has been qualified by any condition other than those prescribed by the *Bid Documents*.
  - .9 Section 00 41 13 Stipulated Price Bid Form is omitted or incomplete.
  - .10 Section 00 41 13 Stipulated Price Bid Form is not dated, unsigned, not sealed, improperly signed, improperly sealed, illegible, obscure, or contains erasures or alterations not called for.
  - .11 Section 00 41 13 Stipulated Price Bid Form does not contain acknowledgement of examination of all addenda issued.
  - .12 Section 00 43 23 Alternative Prices Bid Form Supplement omitted or incomplete, not signed, or not dated.
- .5 All bids become the property of the *Owner* once submitted.

Instructions to Bidders

---

- .6 *Bidders* undertake any expenditure related to the submission of a bid at their own risk and the *Bidder* is solely responsible for all costs associated with preparing and submitting its bid. This includes, without limitation, any and all costs, fees, expenses (travel, accommodations or meals) or other incidentals related to preparing, printing, binding, transporting, presenting, defending, or clarifying the *Bid Documents* or bid process.
  - .7 This Request for Tenders neither expresses nor implies any obligation on the part of the Municipality of East Hants to enter into a contract with any party submitting a response or responses.
  - .8 The *Owner* reserves the right to negotiate, after the *Bid Closing Time*, with any *Bidder* for services and to finalize service arrangements in the best interests of the *Owner*.
  - .9 Municipality of East Hants reserves the right to interpret any and all aspects of the *Bid Documents* as may be most favourable to Municipality of East Hants.
  - .10 The *Owner* may cancel the bid process at any time, for any reason, in its sole discretion. In the event that the bid process is cancelled, the *Owner* will not be obligated to pay any costs, damages, or claims of any type to any *Bidders* or potential *Contractor* or *Tenderer*.
  - .11 In providing a bid, the *Bidder* warrants that their bid is in all respects fair and is provided without collusion or fraud. No representative of the company from which a bid is to be provided may extend entertainment, gifts, gratuities, discounts, or special services, regardless of value, to any employee of Municipality of East Hants. *Bidders* must also advise the *Owner*, in writing, of any potential conflict of interest that may affect, or appear to affect, the bid process, including the influence of award.
  - .12 This process and the procurement of goods and services, if any, resulting from this bid process will be subject to the Atlantic Provinces Standard Terms and Conditions Goods and Services and the terms and conditions noted herein. Where there is a conflict between the Atlantic Provinces Terms and Conditions, Goods and Services and this document, this document shall prevail.
  - .13 In submitting a bid, the *Bidder* has accepted the reservation of rights as set out herein and agrees to be bound by same. Submitting a bid shall be deemed proof that the *Bidder* was aware of and understood the requirements, the terms and conditions, and all other provisions of the bid. The *Owner* and the *Consultant* will not be liable for claims made by a *Bidder* that they were uninformed or unaware of the requirements, terms or conditions of this bid.
- .2 *Contract Award:*
- .1 Delivery by email 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.
    - .1 Original copy of conditional award will be sent following email notification by mail, to the address given by the *Bidder* in its bid on Section 00 41 13.

Instructions to Bidders

---

- .2 It is intended that a *Contract* will be awarded within the *Bid Acceptance Period*. *Contract Documents* will be prepared for signature immediately following *Contract* award and are to be signed within two 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*, including attendance at a bid evaluation meeting if requested by the *Owner*.
- .5 The *Bidder* accepts and agrees that, upon receipt of the notice of conditional award of *Contract*, the *Bidder* will submit copy of *Bidder's* current and valid Certificate of Recognition (COR) issued by a Workers' Compensation Board of Nova Scotia approved audit company.
  - .1 Out-of-province companies may submit a current and valid Certificate of Recognition (COR) or equivalent acceptable to the *Owner* from their place of origin or from a recognized safety association which uses an external audit element.
  - .2 The Certificate of Recognition, or *Owner* accepted equivalent, must be valid and current as of the date of the bid closing, ensuring that the audit requirements of the program have been met.
- .6 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*.
- .7 The form of *Contract* shall be CCDC 2 - 2008, as amended by Section 00 73 00.
- .3 Bid evaluation meeting:
  - .1 The *Bidder* accepts and agrees that they will attend a bid evaluation meeting upon request by the *Owner*.
  - .2 Agenda:
    - .1 Introductions.
    - .2 Overview of their company information.
    - .3 Project organization/Project Management (Project Leader I Project Superintendent I Project Manager) and Project Organization Chart.
    - .4 Key Subcontracts:
      - .1 Mechanical.
      - .2 HVAC.

Instructions to Bidders

---

- .3 Plumbing and Heating.
- .4 Controls.
- .5 Electrical.
- .6 Pool Contractor.
- .7 Structural Steel.
- .8 Site Works Contractor.
- .5 Construction Approach (Methods).
- .6 Understanding of Exterior Envelope Testing Requirements for Roof and Walls.
- .7 Schedule, including material ordering.
- .8 Safety.
- .9 Overview of quality control processes as it applies specifically to this project.
- .10 WCB coverage.
- .11 Safety certification.
- .12 Insurance coverage.
- .13 Bonding.
- .14 Verification of pool contractor's experience in accordance with Section 13 11 13, including:
  - .1 Pool contractor's name.
  - .2 Pool contractor's experience demonstrating that the pool contractor and/or its key personnel full responsibility for 5 installations in the immediate past 5 years.
  - .3 Discussion of quality control and additional measures taken over and above that outlined in the specifications, if any.
  - .4 Discussion of sub-trades (pool tile, pool piping and equipment, concrete formwork contractor for concrete pool tanks).
- .4 Approvals:
  - .1 The award of this bid is subject to approval by the Chief Administrative Officer (CAO) for the Municipality of the District of East Hants and may require further approval by Council.
  - .2 The bid is subject to the obligations and responsibilities of the following trade agreements:
    - .1 Atlantic Procurement Agreement
    - .2 Canada Free Trade Agreement (CFTA).
    - .3 The Canada-European Union Comprehensive Economic and Trade Agreement.

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 Failure to provide bonds and insurance in accordance with requirements of paragraphs 1.19.1 and 1.19.2 of Section 00 21 13 may result in cancellation of conditional award.

**1.21 Freedom of Information**

- .1 *Bidders* are advised that the Municipality of East Hants is governed by Nova Scotia's Freedom of Information and Protection of Privacy Act (FOIPOP) and any information submitted to the Municipality of East Hants in response to this bid may be subject to disclosure under FOIPOP. *Bidders* may identify any confidential information in their bid or any accompanying documentation and are advised to consult with their own legal advisors regarding the appropriate way to identify such information. The Municipality of East Hants will make reasonable efforts to safeguard confidential information, subject to its disclosure requirements under FOIPOP or any disclosure requirements imposed by law or by order of a court or tribunal. *Bidders* are advised that their bids will, as necessary, be disclosed, on a confidential basis, to advisers retained by the Municipality of East Hants to advise or assist with the bid process, including the evaluation of bids. *Bidders* are further advised that the Municipality of East Hants may make public the names of any or all *Bidders* and intends to publish the name of the successful *Bidder* and the total value of any contract entered into with the successful *Bidder*. If a *Bidder* has any questions about the collection and use of information pursuant to this bid, questions are to be submitted to the Tender Contact.

**END OF SECTION**

## 1.1 Information Available for Review

- .1 The following documents are made available for review:
  - .1 Geotechnical report(s):
    - .1 "Geotechnical Investigation – Proposed Building Development, Lot 92-5a1, Commerce Court, Elmsdale, NS", dated February 22, 2017, prepared by Conquest Engineering.
    - .2 "Geotechnical Investigation, Preliminary Letter, Supplementary Boreholes, Proposed Building Development, Lot 92-5a1, Commerce Court, Elmsdale, NS", dated November 27, 2017, prepared by Conquest Engineering.
    - .3 "Geotechnical Investigation – Proposed Building Development, Lot 92-5a1, Commerce Court, Elmsdale, NS", dated November 30, 2017, prepared by Conquest Engineering.
  - .2 Survey(s):
    - .1 As noted on the civil drawings included as part of the *Bid Documents*.
- .2 The accuracy of the information contained in the above listed documents has not been independently verified by the *Consultant*.
- .3 The architect's seal, if applied to the Project Manual, governs only Section 00 31 00 proper, and not the documents listed herein.

**END OF SECTION**

Stipulated Price Bid Form

---

**Project/Contract:** RFC50186 - East Hants Aquatic Centre

**From (*Bidder*):**

\_\_\_\_\_  
company name

\_\_\_\_\_  
street address or postal box number

\_\_\_\_\_  
city/town, province and postal code

\_\_\_\_\_  
contact name

\_\_\_\_\_  
phone number

\_\_\_\_\_  
email address

**To (*Owner*):** The Municipality of East Hants  
Box 230, Suite 170  
15 Commerce Court  
Elmsdale, Nova Scotia B2S 3K5

**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 bonds and proofs of insurance specified in the conditions of the *Contract*, and as described in the *Bid Documents*, and to execute the *Contract* within 2 weeks from the date of notification of acceptance of this bid. We understand and agree that the submittal, by us, to the *Owner* of the required bonds and 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.

Stipulated Price Bid Form

---

- .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.
- .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 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.
- .9 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 Nova Scotia. 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.
- .10 We have completed in full and attach hereto the following bid form supplements, as supplied with the *Bid Documents*:
  - .1 Section 00 43 23 Alternative Prices Bid Form Supplement.
- .11 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.
- .12 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 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\_\_\_\_\_.

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

**END OF SECTION**

Alternative Prices Bid Form Supplement

**Project/Contract:** RFC50186 - East Hants Aquatic Centre

**From (*Bidder*):**

\_\_\_\_\_  
company name

**Signature:**

\_\_\_\_\_  
Signature of authorized signing officer

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

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

We, the above named *Bidder*, offer the alternative prices requested below. The amount to be added to, or deducted from, our bid price (as entered in Section 00 41 13, previously submitted) is entered for each alternative requested. All alternative prices exclude *Value Added Taxes*. If there is no change to the base bid price for an alternative, we have so indicated. We understand, agree, and accept that:

- (a) the *Owner* shall have the right to accept any of the alternatives and corresponding alternative prices in any order or combination, including all or none,
- (b) alternative prices may be considered in determining the most appropriate *Bidder* in accordance with the rules governing bid analysis given under Section 00 21 13,
- (c) alternatives and alternative prices are open for acceptance by the *Owner* for the duration of the *Bid Acceptance Period* and for the duration of the resulting *Contract*,
- (d) the *Work* of the *Contract* and the *Contract Price* will reflect the alternatives and alternative prices, if any, accepted by the *Owner* at the time of contract award, and
- (e) acceptance of any alternatives will not affect the *Contract Time*, unless we have specifically indicated an increase or decrease in the *Contract Time*, in number of days, on account of a particular alternative.

Alternative Price #	Description of Alternative	Amount to be deducted from bid price
1.	To delete Fire Pump Room 010 to the extent indicated on Drawing A101, including partitions, door, fire pump, fuel tank, and associated mechanical and electrical equipment and accessories, and to <i>Provide</i> remaining space as part of Pool Filtration Room 001.	\$

**END OF SECTION**

Canadian Standard Construction Document CCDC 2 - 2008, stipulated price contract, is amended as described in this section.

## **PART 1 - AMENDMENTS TO AGREEMENT BETWEEN OWNER AND CONTRACTOR**

### **1.1 Under Article A-6 – RECEIPT AND ADDRESSES FOR NOTICES IN WRITING:**

- .1 Change paragraph 6.1 to read as follows: “*Notices in Writing* between the parties or between either party and the *Consultant* shall be considered to have been received by the addressee on the date of receipt if delivered by hand or by commercial courier or if sent during normal business hours by fax and addressed as set out below. Such *Notices in Writing* will be deemed to be received by the addressee on the next business day if sent by email after normal business hours or if sent by overnight commercial courier. Such *Notices in Writing* will be deemed to be received by the addressee in the fifth *Working Day* following the date of mailing, if sent by pre-paid registered post, when addressed as set out below. An address for a party may be changed by *Notice in Writing* to the other party setting out the new address in accordance with this Article.”.

## **PART 2 - SUPPLEMENTARY DEFINITIONS**

- .1 Insert a new definition, numbered 27, to read as follows: “**Submittals:** *Submittals* are documents or items required by the *Contract Documents* to be provided by the *Contractor* such as: *Shop Drawings*, samples, models, mock-ups to indicate details or characteristics, before the portion of the *Work* that they represent can be incorporated into the *Work*; and, As-built drawings and manuals to provide instructions to the operation and maintenance of the *Work*.”.
- .2 Insert a new definition, numbered 28, to read as follows: “**Make Good:** *Make Good*, *Made Good*, or *Making Good* means to restore new or existing work that has been rejected by the *Consultant*, damaged, cut, or patched. In addition, *Make Good* or *Making Good* requires the use of materials identical to the original materials, with visible surfaces matching the appearance of the original surfaces in all details, and with no apparent junctions between restored and original surfaces. Where original materials are not available, the *Contractor* shall propose substitute materials for review by the *Consultant* prior to ordering such materials or commencing *Making Good*. *Making Good* may require replacement of affected work in whole or in part.”.

## **PART 3 - SUPPLEMENTARY CONDITIONS**

### **3.1 General**

- .1 Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is deleted by these Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused.

**3.2 Under GC 1.1 – CONTRACT DOCUMENTS:**

- .1 Add the following to the end of subparagraph 1.1.2.2: “except where the *Consultant* shall be indemnified as a third party beneficiary as provided in subparagraphs 9.2.7.4, 9.5.3.4 and in 12.1.3.”.
- .2 Insert a new subparagraph, numbered 1.1.7.5, to read as follows: “In case of discrepancies, noted materials and annotations shall take precedence over graphic indications in the *Contract Documents*.”.
- .3 Change paragraph 1.1.8 to read as follows: “The *Owner* will make available, electronic files for Contractor to replicate as required to carry out the *Work* and make copies of the *Contract Documents*.”.

**3.3 Under GC 1.3 – RIGHTS AND REMEDIES:**

- .1 Insert a new paragraph, numbered 1.3.3, to read as follows: “This *Contract* is not to be construed as authorizing any person to contract for or to incur any obligation on behalf of Her Majesty the Queen in right of Canada, as represented by the Minister of Infrastructure and Communities (“Canada”), or to act an agent for Her Majesty the Queen or Canada.

**3.4 Under GC 2.2 – ROLE OF THE CONSULTANT:**

- .1 At paragraph 2.2.14: delete the comma after the word “submittals” and add the words “which are provided” before the words “in accordance”.
- .2 Insert a new paragraph, numbered 2.2.19, to read as follows: “Verbal instructions and amendments, regardless of their source, will not be binding to the *Contract*.”.

**3.5 Under GC 2.4 – DEFECTIVE WORK:**

- .1 Insert a new paragraph, numbered 2.4.1.1, to read as follows: “The *Contractor* shall rectify, in a manner acceptable to the *Owner* and the *Consultant*, all defective work and deficiencies throughout the *Work*, whether or not they are specifically identified by the *Consultant*.”.
- .2 Insert a new paragraph, numbered 2.4.1.2, to read as follows: “The *Contractor* shall prioritize without additional cost to the *Owner* the correction of any defective work which, in the sole discretion of the *Owner*, adversely affects the day to day operation of the *Owner*.”.

**3.6 Under GC 3.1 – CONTROL OF THE WORK:**

- .1 Insert a new paragraph, numbered 3.1.3, to read as follows: “Prior to commencing individual procurement, fabrication and construction activities, 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 contradictions exist, 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.”.

**3.7 Under GC 3.4 – DOCUMENT REVIEW:**

- .1 Change paragraph 3.4.1 to read as follows: “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 3.14.1 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 from the *Consultant*.”.

**3.8 Under GC 3.5 – CONSTRUCTION SCHEDULE:**

- .1 Change paragraph 3.5.1.1 to read as follows: “Prepare and submit to the *Owner* and the *Consultant*, within 2 calendar weeks of date of Agreement between *Owner* and *Contractor*, a construction schedule that indicates the timing of the major activities of the *Work* and provides sufficient detail of the critical events and their inter-relationship to demonstrate the *Work* will be performed in conformity with the *Contract Time*.”.
- .2 Insert a new paragraph, numbered 3.5.1.4, to read as follows: “Include information relating to the dates for submission and return of *Shop Drawings* required under GC 3.10 SHOP DRAWINGS, as part of the above requirements.”.
- .3 Insert a new paragraph, numbered 3.5.1.5, to read as follows: “Maintain an updated copy of the construction schedule at the *Place of the Work* at all times.”.

**3.9 Under GC 3.6 – SUPERVISION:**

- .1 Remove the second sentence of paragraph 3.6.1. and add a new sentence to the end of paragraph 3.6.1, to read as follows: “The appointed representative and necessary assistants shall not be changed without the *Owner*’s prior approval in writing.”.
- .2 Insert a new paragraph, numbered 3.6.3, to read as follows: “Prior to commencement of the *Work* at the *Place of the Work*, confirm to the *Consultant*, the list of names of the appointed representative, supervisors, and necessary assistants.”.
- .3 Insert a new paragraph, numbered 3.6.4, to read as follows: “The appointed representative and necessary assistants shall devote their time exclusively to the *Work* of this *Contract* and shall remain at the *Place of the Work* during working hours.”.

**3.10 Under GC 3.7 – SUBCONTRACTORS AND SUPPLIERS:**

- .1 Add new sentence to the end of paragraph 3.7.2, to read as follows: “The *Contractor* shall not change any of the *Subcontractors* without the prior written approval of the *Owner*.”.

**3.11 Under GC 3.8 – LABOUR AND PRODUCTS:**

- .1 Change paragraph 3.8.3 to read as follows: “The *Contractor* shall maintain good order and discipline among workers engaged on the *Work* and shall not employ or permit to be employed on the *Work* anyone not skilled in the tasks assigned.”.

**3.12 Under GC 3.10 – SHOP DRAWINGS:**

- .1 Add the words “AND OTHER SUBMITTALS” to the Title after SHOP DRAWINGS”.
- .2 Add the words “and *Submittals*” after the words “*Shop Drawings*” in paragraphs 3.10.1, 3.10.2, 3.10.4, 3.10.7, 3.10.8, 3.10.8.2, 3.10.9, 3.10.10, 3.10.11, and 3.10.12.
- .3 Change paragraph 3.10.3 to read as follows: “Prior to the first application for payment, the *Contractor* and the *Consultant* shall jointly prepare a schedule of the dates for submission and return of *Shop Drawings* and any *Submittals*.”.
- .4 At paragraph 3.10.12: delete the words “with reasonable promptness so as to cause no delay in the performance of the *Work*” and replace with “within 10 *Working Days* or such longer period as may be reasonably required”.

**3.13 New GC 3.14 – PERFORMANCE BY CONTRACTOR:**

- .1 Insert a new General Condition, numbered GC 3.14, and titled “PERFORMANCE BY CONTRACTOR”.
- .2 Insert a new paragraph, numbered 3.14.1, to read as follows: “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*, 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, or procedures which it may recommend to the *Owner*.”.
- .3 Insert a new paragraph, numbered 3.14.2, to read as follows: “The *Contractor* further represents, covenants and warrants to the *Owner* that:”.
- .4 Insert a new paragraph, numbered 3.14.2.1, to read as follows: “The personnel it assigns to the *Project* are appropriately experienced;”.
- .5 Insert a new paragraph, numbered 3.14.2.2, to read as follows: “It has sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the *Owner’s* approval, in the event of death, incapacity, removal or resignation.”.

**3.14 Under GC 5.2 – APPLICATIONS FOR PROGRESS PAYMENT:**

- .1 Change paragraph 5.2.7 to read as follows: “Applications for payment for *Products* manufactured but not yet delivered to the *Place of the Work* will not be considered. Applications for payment for *Products* delivered to the *Place of the Work* but not yet incorporated into the *Work*, provided such *Products* are *Project* specific and cannot readily be used elsewhere, may be considered for payment on an individual basis and shall be supported by such evidence as the *Consultant* may reasonably require to establish the value and delivery of the *Products*.”.

Amendments to CCDC 2 – 2008

---

- .2 Insert a new paragraph, numbered 5.2.8, to read as follows: “The *Contractor* shall submit with each application a current Clearance Letter from the Workers’ Compensation Board of Nova Scotia.”.
- .3 Insert a new paragraph, numbered 5.2.9, to read as follows: “The *Contractor* shall submit to the *Consultant*, with each application for progress payment, a statutory declaration in the form of Canadian standard construction document CCDC 9A - 2001.”.
- .4 Insert a new paragraph, numbered 5.2.10, to read as follows: “Submit to the *Consultant*, an updated three (3) month cash flow forecast with each application for payment including the first application.”.
- .5 Insert a new paragraph, numbered 5.2.11, to read as follows: “Submit a current construction schedule and submittal schedule with each application for payment.”.
- .6 Insert a new paragraph, numbered 5.2.12, to read as follows: “The *Consultant* shall not issue a certificate of payment as described under paragraph 5.3.1 if the *Contractor’s* application for payment is not accompanied by all of the documents described by GC 5.2.”

**3.15 Under GC 5.3 – PROGRESS PAYMENT:**

- .1 Change paragraph 5.3.1.3 as follows:
  - .1 At the 2<sup>nd</sup> line, change “20 calendar days” to read “30 calendar days”.

**3.16 Under GC 5.6 – PROGRESSIVE RELEASE OF HOLDBACK:**

- .1 Change paragraph 5.6.1 as follows:
  - .1 At the third line, change “Owner shall pay” to read, “Owner may pay”.

**3.17 Under GC 5.7 – FINAL PAYMENT:**

- .1 Insert a new paragraph, numbered 5.7.5, to read as follows: “As of the date of the final payment or the date payment is made releasing monies withheld in accordance with the lien legislation applicable to the *Place of the Work*, whichever is the earlier, the *Contractor* expressly waives and releases the *Owner* from all claims except those made in writing prior to that date and still unsettled.”.

**3.18 Under GC 5.8 – WITHHOLDING PAYMENT:**

- .1 Insert a new paragraph, numbered 5.8.2, to read as follows: “In addition to any rights the *Owner* has pursuant to the lien legislation applicable to the *Place of the Work*, if a lien is registered or an action commenced against the *Owner*, the *Owner* shall have the right to withhold from any money otherwise due to the *Contractor*, the full amount claimed in the lien action plus an additional amount sufficient to satisfy all of the *Owner’s* expenses relating to such lien action, including legal and consulting costs. These funds, less expenses incurred, shall be released to the *Contractor* upon the full discharge of all liens and dismissal of all actions against the *Owner*.”

**3.19 Under GC 6.1 – OWNER’S RIGHT TO MAKE CHANGES:**

- .1 Insert a new paragraph, numbered 6.1.3, to read as follows: “Where a change in the *Work* involves additions, deletions, or other revisions to the *Work*, the *Contract Price* shall be increased only by the net actual value of the change in the *Work*, including taxes, but excluding *Value Added Taxes*, plus the following:”.
- .2 Insert a new paragraph, numbered 6.1.3.1, to read as follows: “*Contractor’s* percentage fee for work performed by the *Contractor’s* own forces: 10%, subject to paragraph 6.1.3.5.”.
- .3 Insert a new paragraph, numbered 6.1.3.2, to read as follows: “*Contractor’s* percentage fee for work performed by a *Subcontractor’s* forces: 10%, subject to paragraph 6.1.3.5.”.
- .4 Insert a new paragraph, numbered 6.1.3.3, to read as follows: “*Subcontractor’s* percentage fee for work performed by a *Subcontractor’s* own forces: 10%, subject to paragraph 6.1.3.5.”.
- .5 Insert a new paragraph, numbered 6.1.3.4, to read as follows: “If a *Subcontractor* retains another subcontractor (sub-subcontractor), no additional percentage fee shall be charged to the *Owner* for the sub-subcontract work.”.
- .6 Insert a new paragraph, numbered 6.1.3.5, to read as follows: “Percentage fee may not be charged on changes in the *Work* where there is a net decrease to the *Contract Price*.”.
- .7 Insert a new paragraph, numbered 6.1.4, to read as follows: “Costs for the following items shall be considered to be included in the *Contractor’s* and *Subcontractor’s* percentage fees: ”.
- .8 Insert a new paragraph, numbered 6.1.4.1, to read as follows: “*Contractor’s* site and head office expenses, except as permitted under paragraph 6.3.7 as related to *Change Directives*. ”.
- .9 Insert a new paragraph, numbered 6.1.4.2, to read as follows: “Wages of project managers, superintendents, assistants, watchpersons and administrative personnel, except as permitted under paragraph 6.3.7 as related to *Change Directives*. ”.
- .10 Insert a new paragraph, numbered 6.1.4.3, to read as follows: “Temporary site office, including costs for telephone and facsimile machine, except as permitted under paragraph 6.3.7 as related to *Change Directives*. ”.
- .11 Insert a new paragraph, numbered 6.1.4.4, to read as follows: “Small tools (valued less than \$2000). ”.
- .12 Insert a new paragraph, numbered 6.1.4.5, to read as follows: “As-built documents.”.
- .13 Insert a new paragraph, numbered 6.1.4.6, to read as follows: “Clean-up and disposal of waste materials.”.
- .14 Insert a new paragraph, numbered 6.1.4.7, to read as follows: “Insurance and bonding premiums subject to paragraph 6.1.4.7(1).”.

- .15 Insert a new paragraph, numbered 6.1.4.7(1), to read as follows: “Additional bonding and insurance costs will not be accepted as forming part of the cost of change orders unless the change can be demonstrated as materially affecting risk. Flow through charges from the Surety and/or insurer to the *Contractor* must be substantiated by the Surety and/or insurer as “materially affecting risk” in accordance with CCDC 21 – Guide to Construction Insurances, paragraph 5.8 “Material” Changes in Risk. Material risk must be defined by the Surety and/or insurer and the definition made available to all named parties of the bonds and insurance policies. If a material risk can be demonstrated and is acceptable to all parties, then the obligee and/or named insured is entitled to receive a new bond and/or insurance policy reflecting the change in the *Contract Price*, and the premium for the increase to the bonds and/or insurance policy may then be separated from the overhead mark-up and included as a separate line item in the cost of the change in the *Work*.”.
- .16 Insert a new paragraph, numbered 6.1.5, to read as follows: “Labour costs shall be the actual, prevailing rates at the *Place of the Work* paid to the workers, plus statutory charges on labour including statutory workers' insurance, employment insurance, Canada Pension, vacation pay, medical and health benefits.”.
- .17 Insert a new paragraph, numbered 6.1.6, to read as follows: “Quotations for changes in the *Work* shall be accompanied by itemized breakdowns together with detailed, substantiating quotations or cost vouchers from *Subcontractors* and *Suppliers*, submitted in a format acceptable to the *Consultant*. Fees for *Contractor* owned equipment shall be substantiated by quotations or fee schedules provided by equipment rental companies independent of the *Contractor*.”.
- .18 Insert a new paragraph, numbered 6.1.7, to read as follows: “When additions, deletions, or other revisions to the *Work* covering related work or substitutions are involved in a change to the *Work*, payment, including overhead and profit on net increases to the *Contract Price* only, shall be calculated on the basis of the net difference to the *Contract Price*, if any, with respect to the change in the *Work*.”.
- .19 Insert a new paragraph, numbered 6.1.8, to read as follows: “If any change or deviation in, or omission from the *Work* is made by which the amount of *Work* to be performed is decreased, or if the whole or a portion of the *Work* is dispensed with, no compensation is claimable by the *Contractor* for any loss of anticipated profit in respect thereof.”.
- .20 Insert a new paragraph, numbered 6.1.9, to read as follows: “The *Contractor* shall submit sufficiently detailed information with each *Change Order* or *Change Directive*, showing effect of changes in the *Work* on *Contract Time*, via critical path methodology.”.

### **3.20 Under GC 6.2 – CHANGE ORDER:**

- .1 Insert a new paragraph, numbered 6.2.3, to read as follows: “The procedures of evaluation including applicable overhead and profit mark-up provisions for *Change Orders* shall be as described under GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES.”.

**3.21 Under GC 6.3 – CHANGE DIRECTIVE:**

- .1 Change paragraph 6.3.6 to read as follows: “The adjustment in the *Contract Price* for a change carried out by way of a *Change Directive* shall be determined by: Estimate and acceptance of a lump sum; or, unit prices set out in the *Contract* or subsequently agreed upon; or, actual cost of expenditures and savings to perform the work attributable to the change plus a percentage fee as described under paragraph 6.1.3 of GC 6.1 – OWNER’S RIGHT TO MAKE CHANGES; and as follows.”.
- .2 Change paragraph 6.3.6.3 to read as follows: “In the case of a change in the *Work* to be valued in accordance with the estimate and acceptance of a lump sum method, the *Contractor* shall present to the *Consultant* for approval a detailed estimate of the costs of the *Contractor* and the involved *Subcontractors* including products, labour itemized by man hours, labour burden and the percentage fee of each of the involved *Subcontractors* shown separately. The percentage fee provisions for *Change Directives* shall be as described under paragraph 6.1.3 of GC 6.1 – OWNER’S RIGHT TO MAKE CHANGES.”.
- .3 Insert a new paragraph, numbered 6.3.6.4, to read as follows: “The form of the presentation of costs and methods of measurement shall be agreed to by the *Owner*, through the *Consultant*, and the *Contractor* before proceeding with the change.”.

**3.22 Under GC 6.4 – CONCEALED OR UNKNOWN CONDITIONS**

- .1 Insert a new paragraph, numbered 6.4.5, to read as follows: “The *Contractor* confirms that, prior to bidding the *Project*, it carefully investigated the *Place of the Work* and applied to that investigation the degree of care and skill described in paragraph 3.14.1, given the amount of time provided between the issue of the bid documents and the actual closing of bids, the degree of access provided to the *Contractor* prior to submission of bid, and the sufficiency and completeness of the information provided by the *Owner*. 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 careful investigation undertaken prior to the submission of the bid.”.

**3.23 Under GC 6.5 – DELAYS:**

- .1 Delete the period at the end of paragraph 6.5.1, and substitute the following words: “, but excluding any consequential, indirect or special damages.”.
- .2 Insert a new paragraph, numbered 6.5.6, to read as follows: “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 *Contract Time* shall be extended for such reasonable time as the *Consultant* may decide in consultation with the *Contractor*. The *Owner* shall be reimbursed by the *Contractor* for all reasonable costs incurred by the *Owner* as a result of such delay, including 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 provisions of these General Conditions and any later, actual date of *Substantial Performance of the Work* achieved by the *Contractor*.”.

**3.24 Under GC 6.6 – CLAIMS FOR A CHANGE IN CONTRACT PRICE**

- .1 Change paragraph 6.6.5 as follows: Add the words “as noted in paragraph 6.6.3” after the words “of the claim” and add the words “and the *Consultant*”, at the end of the paragraph.

**3.25 Under GC 9.1 – PROTECTION OF WORK AND PROPERTY:**

- .1 Change paragraph 9.1.1.1 to read as follows: “errors in the *Contract Documents* which the *Contractor* could not have discovered applying the standard of care described in paragraph 3.14.1.”.
- .2 Change paragraph 9.1.2 to read as follows: “Before commencing any *Work*, the *Contractor* shall determine the locations of all underground utilities and structures indicated in 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 3.14.1.”.

**3.26 Under GC 9.2 - TOXIC AND HAZARDOUS SUBSTANCES:**

- .1 At paragraph 9.2.6, add the following words 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.”.
- .2 At paragraph 9.2.7.4: add the words “and the *Consultant*” after the word “*Contractor*”.
- .3 At paragraph 9.2.8, add the following words after the word “responsible”: “or that 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.”.

**3.27 Under GC 9.5 – MOULD:**

- .1 At paragraph 9.5.3.4: add “and the *Consultant*” after “*Contractor*”.

**3.28 Under GC 10.2 - LAWS, NOTICES, PERMITS AND FEES:**

- .1 Add the following to the end of paragraph 10.2.3: “The *Contractor* shall be responsible for the procurement and payment of construction damage deposits levied by the municipality in connection with the issuance of a building permit.”.
- .2 At paragraph 10.2.5: delete the word “The” from the first line and substitute the words “Subject to paragraph 3.14.1, the”.

**3.29 Under GC 10.4 - WORKERS' COMPENSATION:**

- .1 Change paragraph 10.4.1 as follows:

Amendments to CCDC 2 – 2008

---

- .1 In the first line, after the words "Prior to commencement of the *Work*", insert the words, "again with each of the *Contractor's* applications for payment,"

**3.30 Under GC 11.2 – CONTRACT SECURITY:**

- .1 Insert a new paragraph, numbered 11.2.3, to read as follows: "The *Contractor* shall provide a performance bond, and a labour and materials payment bond, each issued by a bonding company acceptable to *Owner* and licensed to issue such instruments in the Province of Nova Scotia, in the amounts and forms as follows:".
- .2 Insert a new paragraph, numbered 11.2.3.1, to read as follows: "Amount of performance bond shall be equal to not less than 50% of the *Contract Price*:".
- .3 Insert a new paragraph, numbered 11.2.3.2, to read as follows: "The form of performance bond shall be CCDC 221:".
- .4 Insert a new paragraph, numbered 11.2.3.3, to read as follows: "Amount of Labour and material payment bond shall be equal to not less than 50% of the *Contract Price*:".
- .5 Insert a new paragraph, numbered 11.2.3.4, to read as follows: "The form of Labour and material payment bond shall be CCDC 222:".

**3.31 Under GC 12.1 – INDEMNIFICATION:**

- .1 Insert a new paragraph, numbered 12.1.1.3, to read as follows: "The *Contractor* shall indemnify and hold harmless the *Consultant*, its agents and employees 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 *Contract*, provided such claims are attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, and caused by negligent acts or omissions of the *Contractor* or anyone for whose acts the *Contractor* may be liable, and made in writing within a period of 6 years from the date of *Substantial Performance of the Work* as set out in the certificate of *Substantial Performance of the Work*, or within such shorter such period as may be prescribed by any limitation statute of the Province or Territory of the *Place of Work*:".

**3.32 Under GC 12.3 – WARRANTY:**

- .1 At paragraph 12.3.2: delete the word "The" from the first line and substitute the words "Subject to paragraph 3.14.1, the ...".
- .2 Insert a new paragraph, numbered 12.3.7, to read as follows: "The *Contractor* shall commence to correct any deficiency within 5 *Working Days* after receiving notice from the *Owner* or *Consultant*, and complete the work as expeditiously as possible, except that in case the deficiency would prevent maintaining security or keep basic systems essential to ongoing business of the *Owner*, operational as designed, all necessary corrections and/or installations of temporary replacements shall be carried out immediately as an emergency service. Should the *Contractor* fail to commence or correct any deficiency within 5 *Working Days* or to provide emergency service within 24 hours of a request made, by fax and/or email during normal business hours by the *Owner*, the *Owner* is authorized, regardless of GC 3.1, to carry out necessary repairs or replacements at the *Contractor's* expense:".

**END OF SECTION**

General Instructions

---

## **PART 1 - GENERAL**

### **1.1 Language of the *Contract***

- .1 The use of the words “include” or “including”, or variations thereof, within the *Contract Documents* is not limiting.

### **1.2 The *Contract Documents***

- .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*. 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 As a result, the *Consultant* 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.
- .3 Further, 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*.
- .4 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.
- .5 This section coordinates, relates, and governs the work of other sections of the specifications.

### **1.3 Laws, Notices, Permits and Fees**

- .1 The building code – The Nova Scotia Building Code, under N.S. Reg. 26/2017, shall govern the *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*. 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.

General Instructions

---

**1.4 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*, 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*, as in the case of finishing and surfacing work, shall include a thorough examination of the condition of the previous 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 Do not commence work until unsatisfactory conditions are corrected. Commencement of work implies acceptance of surfaces, tolerances, and conditions and existing conditions will not be accepted as a contributing factor to subsequent failure or acceptability of the *Work*.

**1.5 Quantity of Items**

- .1 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*.

**1.6 Standards and Codes**

- .1 *Contract* forms, codes, specifications, standards, manuals and installation, application and maintenance instructions referred to in these specifications, unless otherwise specified, amended or date suffixed, shall be latest published editions at *Contract* date.

**1.7 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 instructions 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 instructions.

General Instructions

---

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

- .1 Make good roads, soft landscaping, walkways, curbs, sidewalks, possessions and property, soiled or damaged due to the *Work*, to requirements of authorities having jurisdiction and requirements of *Making Good*, as applicable.
- .2 Fully protect adjacent site improvements, services, landscaping, and other works using suitable covering and support framing, to prevent damage by construction related activities.

**1.9 Public Utilities and Services**

- .1 Verify limitations imposed on the *Work* by presence of utilities and services, and ensure no damage occurs to them.
- .2 Notify service authorities concerned so that they protect, remove, relocate, or discontinue them, as they may require.
- .3 Make arrangements and pay for connection charges for services required for the *Work*.
- .4 Locate new poles, pipes, conduit, wires, fill pipes, vents, regulators, meters, and sanitary services in inconspicuous locations. If not indicated in *Contract Documents*, verify location with *Consultant* before commencing installation.

**1.10 Work on Public Property**

- .1 Include curb cuts and making good of existing property to *Provide* fully paved and finished approaches to requirements of authorities having jurisdiction.
- .2 Include making good of existing curbs, walks, paving and soft landscaping on adjacent property.

**1.11 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*.
- .4 Establish existing bench marks, grades, lines, levels, and temporary, widely separated bench marks. Employ the services of a firm of registered land surveyors licensed in the *Place of the Work*.
- .5 Surveyor shall verify grades, lines, levels at the *Place of the Work* critical setting out points specified herein, and dimensions shown and report discrepancies in levels or dimensions before commencing *Work*. Where discrepancies between intended layout and existing conditions are found to exist, prepare and submit a detailed report to *Consultant*, including schematic digital layout of conflicting conditions, in format compatible with currently licensed edition of AutoCAD software for *Consultant's* use in reconciling these issues. Surveyor shall lay out building areas, and floor elevations.

General Instructions

---

- .6 Surveyor shall verify location and datum reference elevation of finished foundations, relative to reference markers, showing actual finished grades in relation to noted grades in the *Contract Documents*. Prepare and submit a reproducible plan of survey certified As-Built by above firm and in format compatible with currently licensed edition of AutoCAD software, prior to date of *Substantial Performance of the Work*.
- .7 Preserve bench marks, reference points and stakes.
- .8 Upon completion of foundation work, prepare and submit an accurate survey showing the location of the foundations at the *Place of the Work*, foundation wall dimensions, and the gross floor area of the foundation plan. The survey is to be prepared by a Registered Nova Scotia Land Surveyor acceptable to the *Owner* and to the *Consultant*. Submit 4 copies of this survey to the *Consultant* at time of completion of foundation work plus 1 digital copy in format compatible with currently licensed edition of AutoCAD software. Submit additional copies as part of the closeout submittals in accordance with Section 01 77 00.
- .9 Prepare and submit record survey documents and survey logs for incorporation into project record documents in accordance with Section 01 77 00.
- .10 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.

**1.12 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 Modified' shop drawings.
  - .3 Construction and submittal schedules.
  - .4 *Supplemental Instructions*, proposed *Change Orders*, *Change Orders*, and *Change Directives*.
  - .5 Field Test Reports.
  - .6 *Consultant's* field review reports and deficiency reports.
  - .7 Reports by authorities having jurisdiction.
  - .8 Building and other applicable permits, and related permit documents.
  - .9 Requests for interpretation and RFI log.
  - .10 Daily log (maintained in bound format and available for viewing by the *Consultant* and the *Owner*), including:
    - .1 Weather (precipitation, high and low temperatures, wind, and visibility).
    - .2 Pertinent site conditions (muddy, flooded, frozen ground, water level).
    - .3 Number of workers actively working at the *Place of the Work* by each subcontract.

General Instructions

---

- .4 *Subcontractors* working at the *Place of the Work*.
- .5 Parts of the *Work* being worked on.
- .6 Working hours worked at the *Place of the Work*.
- .7 Activities with intermittent progress.
- .8 Time lost and explanation for such time lost.
- .9 Difficulties (work scheduled to start but did not with the reason why, delays, labour inefficiencies, labour shortage, weather).
- .10 *Products* and materials delivered.
- .11 Equipment mobilized and/or demobilized.
- .12 Excavation conditions.
- .13 Start and finish date of each part of the *Work*.
- .14 Erection and removal dates of formwork.
- .15 Date, quantities and particulars of each concrete pour.
- .11 As-built drawings recording as-built conditions, instructions, changes for structure, equipment, wiring, plumbing, and the like, as called for in Section 01 77 00 and Divisions 21, 22, and 23 and Divisions 26, 27, and 28, prior to being concealed.
- .2 Make above material available to *Consultant* upon request.

**1.13 Concealed Services**

- .1 Conceal wiring, conduit, pipes and ductwork in finished areas, unless otherwise indicated.

**1.14 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*.
- .2 The exceptions to this requirement are trademarks and labels which are essential to identify materials, systems, assemblies, and equipment for maintenance and replacement purposes, and for life safety, fire resistance and temperature rise ratings.

**1.15 Survey Location Devices**

- .1 Replace, at no additional cost to the *Owner*, any iron pins and survey bars, monuments, geodetic datum and similar reference markers, which are disturbed, moved, or lost in course of construction.

**1.16 Waste Disposal**

- .1 Comply with requirements of authorities having jurisdiction.

---

General Instructions

---

- .2 Waste generated by the *Work* must be disposed of in East Hants at the Waste Management Centre in Georgefield, NS. East Hants will waive the tipping fees for such waste when being disposed of appropriately at the Waste Management Centre and when properly identified as waste from this project. Waste must be disposed in accordance with the regulations respecting Solid-Waste Resource Management and Material Banned from Disposal Site in Nova Scotia (<https://www.novascotia.ca/nse/waste/regulations.asp>) and the East Hants By-Law# 4-6 Solid Waste Resource Collection and Disposal Bylaw (<https://www.easthants.ca/wpcontent/uploads/2016/01/Bylaw-4-6.pdf> ).
- .3 East Hants Solid Waste Division staff are available for consultation, training, and support for the *Contractor* to ensure compliance with regulations/bylaws outlined. This can include pre-construction meetings, assessing needs with the *Contractor* and their waste hauler, staff training, and other supports.
- .4 In an effort to reduce waste disposal, East Hants requires the following collection streams for the *Work*:
  - .1 Organics: food waste, leaf and yard waste.
  - .2 Recycling: cardboard and paper.
  - .3 Recycling: mixed plastics/Styrofoam.
  - .4 Clean wood.
  - .5 Metal.
  - .6 Garbage.
- .5 East Hants will not accept any commercial products designated hazardous. This material must be managed with an approved company.

**1.17 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 Ensure that accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment are provided in layout of equipment and services; notify *Consultant* if indicated clearances are in conflict.
- .4 Prepare coordination and interference drawings in accordance with Section 01 33 00.

**1.18 Not In Contract Items**

- .1 NIC (Not In *Contract*) shall be used to designate various items of equipment that require coordination for installation although are not *Provided* as part of the *Work*.

**1.19 Publicity Releases and Photographs**

- .1 No press or publicity releases will be permitted without prior written approval of the *Owner*.
- .2 No photographs of the *Place of the Work* or of any portion of the *Work* will be permitted without written approval of the *Owner*, except as provided by the *Contract Documents*.

General Instructions

---

**1.20 Electronic Files**

.1 Electronic DWG Files:

- .1 The *Contractor* shall be provided 1 digital DWG file of the Issue for Construction Drawings from the agreeing Sub-Consultants free of charge upon request.
  - .1 *Subcontractors* and *Suppliers* shall obtain copies of the DWG file(s) from the *Contractor*.
  - .2 The *Contractor* shall obtain signed copies of the disclaimer from each subcontractor and supplier prior to providing the digital DWG file(s) and forward all signed copies of the disclaimer with the *Consultant*.
  - .3 The *Consultant* will not provide DWG file(s) directly to the *Subcontractors* or *Suppliers* directly.
- .2 The DWG files are an export of the Revit Model. A PDF or DXF of the drawings may accompany the DWG files for reference.
- .3 The *Contractor* must provide a signed copy of the CAD Disclaimer to the *Consultant* prior to delivery of the files. A copy of the CAD Disclaimer is appended to this section for reference.

.2 Electronic RVT Files

- .1 The *Contractor* may be provided 1 digital RVT file of the Issue for Construction Model from the Sub-Consultants free of charge upon request.
  - .1 *Subcontractors* and *Suppliers* shall obtain copies of the RVT file(s) from the *Contractor*.
  - .2 The *Contractor* shall obtain signed copies of the disclaimer from each subcontractor and supplier prior to providing the RVT file(s) and forward all signed copies of the disclaimer with the *Consultant*.
  - .3 The *Consultant* will not provide RVT file(s) directly to the *Subcontractors* or *Suppliers*.
- .2 The *Contractor* must provide a signed copy of the Electronic BIM Transfer Request Disclaimer to the *Consultant* prior to delivery of the files. A copy of the Electronic BIM Transfer Request Disclaimer is appended to this section for reference.

**PART 2 - PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## ELECTRONIC DOCUMENT TRANSFER REQUEST

PROJECT NAME: East Hants Aquatics Centre  
PROJECT NUMBER: 1609  
DATE: XXXXX  
COMPANY REQUESTING FILES: XXXXX  
PERSON REQUESTING FILES: XXXXXXXX  
INTENDED USE OF FILES: Distribution to Sub-Trades  
DESCRIPTION OF FILES: AutoCAD Drawing version 2013

---

1. The requested electronic files(s) (the "Files") remain the property of the applicable consultant (MacLennan Jaunkalns Miller Architects, TEAL Architects and Planners, Campbell Comeau Engineering Ltd, Smith + Andersen, Strum Consulting) including all copyright therein.
  2. There is no warranty expressed or implied, that the intended use of the Files will meet the business purpose of the Company receiving the Files or that the Files represent or reflect the complete scope of work.
  3. Company receiving the Files shall indemnify and hold the consultant harmless from any claims or damages arising from the use of the Files in the execution of the work.
  4. In the event that the drawing files transferred contain consultant title block, permits or professional seals, the Files shall be immediately returned to consultant and all copies thereof destroyed.
  5. The Company receiving the files is not permitted to alter or revise the files, including the drawings or the scope of work, unless authorized in writing by the consultant.
  6. No use shall be made of the Files for any purpose other than the one stated above, without the written consent of the consultant.
  7. No re-transmission of the files or parts thereof, in any form to any third party is permitted unless authorized in writing by the consultant.
  8. Any data contained in the Files, including the internal file structure, etc., is the property of the consultant, and shall be kept confidential by the recipient.
  9. Drawings shall not be used for shop drawing purposes except to aid the third party in producing their own original digital shop drawings. If there are any indications that that these digital files have been copied for shop drawings purposes, they will be returned and asked to be resubmitted at no cost to client or effect to schedule.
- 

Having read and understood the above, the undersigned agrees to be bound by the terms thereof.

---

Signature of Company's Authorized Representative

---

Date

## ELECTRONIC BIM DISCLAIMER

PROJECT NAME:	East Hants Aquatics Centre
PROJECT NUMBER:	1609
DATE:	XXXXX
COMPANY REQUESTING FILES:	XXXXX
PERSON REQUESTING FILES:	XXXXXXXX
INTENDED USE OF FILES:	XXXXXXXX
BIM FILE NAME:	XXXXXXXX
BIM FILE TYPE:	rvt. (Autodesk Revit Model - Version 2017)
DATE OF BIM:	XXXXX

---

1. The Building Information Model (BIM) being requested in the form of an electronic rvt. file(s) remain the property of the applicable consultant (MacLennan Jaunkalns Miller Architects, TEAL Architects and Planners, Campbell Comeau Engineering Ltd, Smith + Andersen, Strum Consulting) including all copyright therein.
2. There is no warranty expressed or implied, that the intended use of the BIM will meet the business purpose of the Company receiving the BIM or that the BIM represent or reflect the complete scope of work.
3. Company receiving the BIM shall indemnify and hold the consultant harmless from any claims or damages arising from the use of the BIM in the execution of the work.
4. The BIM being provided at the request of and for the convenience of the recipient only. It may be incomplete, contain unintentional inaccuracies or be partially obsolete.
5. The BIM will be detached and static as per the date outlined above, it will not be automatically updated with any revisions made during construction. User of the BIM are advised to review all current versions, as well as subsequent revisions, of project documentation for inconsistencies. It is the responsibility of the user to identify and make all required revisions to this data. MJMA/TEAL will not routinely issue updates to the BIM.
6. The BIM does not supersede contract documents or traditional allocation of responsibilities.
7. The BIM will contain model geometry, views and sheets. In the event that the drawing files transferred contain consultant title block, permits or professional seals, the Files shall be immediately returned to consultant and all copies thereof destroyed.
8. The Company receiving the BIM is not permitted to alter or revise the files, including the drawings or the scope of work, unless authorized in writing by the consultant.
9. No use shall be made of the Files for any purpose other than the one stated above, without the written consent of the consultant.

10. Modeled elements are representations of building elements and data within those elements, such as reference to manufacturers or product types, do not supersede the project specification or contract documents. An RFI should be issued if any clarification is required.
11. The Level of Development chart in the BIM Execution Plan shall outline the intended reliability of model elements. In the event this documents does not exist all schedules or quantity takeoffs produced from the Revit model should be checked against traditional quantity takeoff methods utilizing the contract documents. Where there is a conflict between the electronic file and the physical copies, the physical copies shall govern.
12. Any data contained in the BIM, including the internal file structure, etc., is the property of the consultant, and shall be kept confidential by the recipient.
13. Drawings shall not be used for shop drawing purposes except to aid the third party in producing their own original digital shop drawings. If there are any indications that these digital files have been copied for shop drawings purposes, they will be returned and asked to be resubmitted at no cost to client or effect to schedule
14. The user is advised that any translation of BIM data from one computer system or environment to another can result in the loss of important data. MJMA/TEAL makes no representations as to the usability of this BIM data on other systems. The above includes Revit upgrades and altering the file type to another format such as Navisworks, Industry Foundation Class and so forth.
15. While reasonable care has been used to ensure that the transfer medium and the material are free of computer viruses, MJMA/TEAL accepts no responsibility for any loss or damage that might result from the transmission of computer viruses in this process.
16. Elements included in the BIM data are property of MJMA/TEAL and are protected by intellectual property laws including copyright laws. The recipient of the BIM data agrees to be bound by any such intellectual property and copyright laws and other than using it specifically for the above mentioned project, shall not sell, transfer, modify, use or otherwise incorporate these elements into its own office standards or it will be in violation of such laws.
17. The terms of this disclaimer are effective immediately upon User's receipt of the digital information. By proceeding to open the Model the User agrees to be bound by the terms of this agreement

---

Having read and understood the above, the undersigned agrees to be bound by the terms thereof.

---

Signature of Company's Authorized Representative

---

Date

maclennan jaunkalns miller architects  
TEAL Architects + Planners

Product Substitution Procedures

---

## PART 1 - GENERAL

### 1.1 Approved Alternates and Approved Equals

- .1 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*.
- .2 The process for proposing and approving alternates or equals shall be the same process as for proposing and approving substitutions (refer to paragraph 1.2 below).
- .3 Confirm delivery of specified items prior to proposing alternates or equals.

### 1.2 Substitutions

- .1 Submission of substitutions:
  - .1 Proposals for substitutions of *Products* and materials must be submitted in accordance with procedures specified in this section.
  - .2 *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*.
- .2 Submission requirements:
  - .1 Description of proposed substitution, including detailed comparative specification of proposed substitution with the specified *Product*.
  - .2 Manufacturer's *Product* data sheets for proposed *Products*.
  - .3 Respective costs of items originally specified and the proposed substitution.
  - .4 Confirmation of proposed substitution delivery, in writing by *Product* manufacturer.
  - .5 Compliance with the building codes and requirements of authorities having jurisdiction.
  - .6 Affect concerning compatibility and interface with adjacent building materials and components.
  - .7 Compliance with the intent of the *Contract Documents*.
  - .8 Effect on *Contract Time*.
  - .9 Reasons for the request.
  - .10 Detailed availability of maintenance services and sources of replacement materials and parts, including associate costs and time frames.
- .3 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.

Product Substitution Procedures

---

- .4 Proposed substitutions shall include costs associated with modifications necessary to other adjacent and connecting portions of the *Work*.
- .5 *Consultant's* decision concerning acceptance or rejection of proposed substitutions is final.

**PART 2 - PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

Requests for Interpretation

---

## PART 1 - GENERAL

### 1.1 Request for Interpretation – RFI

- .1 A request for interpretation (RFI) is a formal process used during the *Work* to obtain an interpretation of the *Contract Documents* pursuant to GC 2.2.7 through GC 2.2.10 (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 Interpretation” 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 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*.
    - .2 RFIs shall be submitted only to the *Consultant*.
    - .3 RFIs shall be submitted only by *Contractor*. RFIs submitted by *Subcontractors* or *Suppliers* shall not be accepted.
    - .4 Number RFIs consecutively in one sequence in order submitted.
    - .5 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 and at each progress meeting in accordance with Section 01 31 19..
  - .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*.
    - .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*.

#### Requests for Interpretation

---

- .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 *Contractor* shall satisfy itself that an RFI is warranted by undertaking a thorough review of the *Contract Documents* to determine that the claim, dispute, or other matters in question relating to the performance of the *Work* or the interpretation of the *Contract Documents* cannot be resolved by direct reference to the *Contract Documents*. *Contractor* shall describe in detail this review on the RFI form as part of the RFI submission. RFI submittals that lack such detailed review description, or where the detail provided is, in the opinion of the *Consultant*, insufficient, shall not be reviewed by the *Consultant* and shall be rejected.

#### **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:** \_\_\_\_\_

**Owner:** \_\_\_\_\_

**To:** \_\_\_\_\_

(Consultant's  
Representative)

**Project No.:** \_\_\_\_\_

**Consultant's Fax  
No.:** \_\_\_\_\_

**RFI No.:** \_\_\_\_\_

**Date of** \_\_\_\_\_

**Request:** \_\_\_\_\_

**Contractor:** \_\_\_\_\_

**Contractor's  
Representative:** \_\_\_\_\_

**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:**

**By:** \_\_\_\_\_

**Supplemental Instruction Accepted:**

**By:** \_\_\_\_\_

**Consultant**

**Date**

**Contractor**

**Date**

**Cc:** ☐ Owner ☐ Consultant ☐ Contractor ☐ Field ☐ Other: \_\_\_\_\_

## **PART 1- GENERAL**

### **1.1 General**

- .1 *Provide the Work in accordance with the Contract Documents and be responsible for delays or costs resulting from failure to properly inspect or coordinate the Work, and for replacement or corrective work required.*

### **1.2 Identification of Systems**

- .1 *Provide identification of electrical and mechanical system installations and other automated systems or equipment in compliance with Contract Documents.*

### **1.3 Commissioning and Systems Demonstrations**

- .1 Provide testing, adjusting, balancing and certification and commissioning of mechanical and electrical installations and other automated systems or equipment in accordance with Section 01 91 13 and Section 01 77 00.
- .2 Instruct *Owner's* designated representatives in operation and maintenance of mechanical and electrical installations and other automated systems or equipment, in accordance with Section 01 91 13 and Section 01 77 00.

### **1.4 Project Manager and Superintendent**

- .1 Provide project manager, 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 project manager 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*.
- .3 The project manager shall fulfill the role of supervisor in accordance with GC 3.6.

### **1.5 Dimensions**

- .1 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.

### **1.6 Coordination**

- .1 Coordinate and ensure workers, *Subcontractors*, and *Suppliers* cooperate to ensure that the *Work* will be carried out expeditiously and in proper sequence.
- .2 Make adjustments to allow adjustable work fit to fixed work.

### **1.7 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.

Coordination

---

- .2 *Provide* 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.
- .3 Supply items to be built in, as and when required together with templates, measurements, shop drawings and other related information and assistance.
- .4 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.
- .5 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.
- .6 Check and verify dimensions referring to interfacing of services. Verify such dimensions with interconnected portions of the *Work*.
- .7 Do not scale directly from drawings. Obtain clarification from *Consultant* if there is ambiguity or lack of information.
- .8 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*.
- .9 Advise *Consultant* of discrepancies and omissions in the *Contract Documents*, that affect aesthetics, or that interfere with services, equipment or surfaces. Do not proceed with work affected by such items without clarification from *Consultant*.
- .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.
- .12 Prepare interference drawings to properly coordinate the *Work*, where necessitated, in accordance with Section 01 33 00.

**PART 2 - PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

Project Meetings

---

## **PART 1 - GENERAL**

### **1.1 Administrative**

- .1 The *Contractor* shall schedule meetings as specified herein.
  - .1 Such scheduling shall be in consultation both with the *Owner* and with the *Consultant*.
- .2 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, complete with meeting agenda, 5 *Working Days* in advance of meeting date to the *Consultant* and the *Owner* and other affected parties.
- .4 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 2 *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 not attend meetings unless authorized by the *Consultant* and the *Owner*.
- .7 The *Contractor* shall prepare, and distribute to the *Consultant* and the *Owner* 5 days in advance of next progress meeting date, the following:
  - .1 Monthly progress reports containing updated schedules, shop drawing logs, requests for interpretation logs, submittals and budget.

### **1.2 Contract Start-Up Meeting**

- .1 Within 5 days after award of *Contract*, request a meeting of parties in *Contract* to discuss and resolve administrative procedures and responsibilities prior to the commencement of the *Work*.
- .2 Attendees at *Contract* start-up meeting shall include the following:
  - .1 *Contractor*.
  - .2 *Contractor's* site superintendent(s).
  - .3 *Consultant*.
  - .4 *Owner*.
  - .5 Inspection and testing company.
- .3 Agenda to include the following:
  - .1 Appointment of official representative of participants in the *Project*.
  - .2 Status of permits, fees and requirement of authorities having jurisdiction. Action required.
  - .3 Establishing a schedule for progress meetings.

### Project Meetings

---

- .4 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.
- .5 Submittal procedures.
- .6 Schedule of submission of samples, colour chips, and items for *Owners* and/or *Consultant's* consideration.
- .7 Construction schedule and progress scheduling.
- .8 Delivery schedule of specified equipment.
- .9 Quality assurance and control requirements.
- .10 Appointment of inspection and testing agencies or firms.
- .11 Requirements for notification for reviews. Allow a minimum of 48 hours' notice to *Consultant* for review of the *Work*.
- .12 Requirements for temporary facilities, signs, offices, storage sheds, utilities, fences.
- .13 Requirements for firestopping coordination and preparation of firestopping manual.
- .14 Security requirements at and for the *Place of the Work*.
- .15 Record drawings.
- .16 Maintenance manuals.
- .17 Take-over procedures, acceptance, warranties.
- .18 Progress claims, administrative procedures, holdbacks.
- .19 Insurances, transcripts of policies.
- .20 *Contractor's* safety procedures.
- .21 Cleaning area for vehicles.
- .22 Workers' Compensation Board of Nova Scotia Clearance Letter.

### 1.3 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*.

### Project Meetings

---

- .4 Manufacturer's representatives, as applicable.
- .5 Inspection and testing company, as applicable.
- .4 Agenda to include the following:
  - .1 Appointment of official representatives of participants in the *Project*.
  - .2 Review of existing conditions and affected work, and testing thereof as required.
  - .3 Review of installation procedures and requirements.
  - .4 Review of environmental and site condition requirements.
  - .5 Schedule of the applicable portions of the *Work*.
  - .6 Schedule of submission of samples, colour chips, and items for *Consultant's* consideration.
  - .7 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences.
  - .8 Requirements for notification for reviews. Allow a minimum of 48 hours' notice to *Consultant* for review of the *Work*.
  - .9 Requirements for inspections and tests, as applicable. Schedule and undertake inspections and tests.
  - .10 Delivery schedule of specified equipment.
  - .11 Special safety requirements and procedures.

#### 1.4 Progress Meetings

- .1 During the course of the *Work* prior to *Substantial Performance of the Work*, schedule progress meetings as directed by the *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 Review, approval of proceedings of previous meeting.
  - .2 Review of items arising from proceedings.
  - .3 Review of progress of the *Work* since previous meeting and *Contractor's* monthly progress report.
  - .4 Field observations, problems, conflicts.
  - .5 Update construction schedule.
  - .6 Problems that impede compliance with construction schedule.
  - .7 Review of off-site fabrication delivery schedules.
  - .8 Review material delivery dates/schedule.

### Project Meetings

---

- .9 Corrective measures and procedures to regain construction schedule.
- .10 Revisions to construction schedule.
- .11 Progress, schedule, during subsequent period of the *Work*.
- .12 Review submittal schedules.
- .13 Review status of submittals.
- .14 Maintenance of quality standards.
- .15 Pending changes and substitutions.
- .16 Review of *Contract* modifications and interpretations including, but not limited to: requests for interpretation and log, contemplated change orders, *Change Orders*, *Change Directives*, *Supplemental Instructions*, for effect on construction schedule and on *Contract Time*.
- .17 Review of status of as-built documents.
- .18 Other business.

#### 1.5 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*, *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 Progress, schedule, during succeeding period of the *Work*.
  - .10 Review submittal requirements for warranties, manuals, and all demonstrations and documentation required for *Substantial Performance of the Work*, including maintenance materials.
  - .11 Review of keying and hardware requirements.
  - .12 Review of status of as-built documents and record drawings.
  - .13 Status of commissioning and training.
  - .14 Review *Contractor's* deficiency list and status.

## Project Meetings

---

- .15 Cleaning for occupancy.
- .16 Other business.

### 1.6 Post-Construction Meeting

- .1 Prior to application for completion of *Contract*, schedule a post-construction meeting. Four 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 *Consultant* 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.

### 1.7 Special Meetings

- .1 *Owner* and/or *Consultant* reserve 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 promptly to all in attendance and those affected by agreements made at such meetings.

## PART 2 - PRODUCTS

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## PART 1 - GENERAL

### 1.1 General

- .1 Schedules required:
  - .1 Construction schedule.
  - .2 *Product* delivery schedule.
  - .3 Inspection and testing schedule.
  - .4 Landscaping schedule:
- .2 Format:
  - .1 Construction Schedule shall to be developed in the form of a GANTT chart utilizing one of the following:
    - .1 Microsoft Project 2003 (or later version). Include a separate bar for each trade or operation.
    - .2 Primavera Project Planner version 3.1 (or later version). Include a separate bar for each trade or operation.
  - .2 Include horizontal time scale identifying the first *Working Day* of each week.
  - .3 Format for listings: The chronological order of the start of each item or part of the *Work*.
  - .4 Identification of listings: By systems description.
  - .5 Upon request by the *Consultant*, submit a digital copy of the construction schedule to the *Consultant*. The digital copy shall be in a native file type that permits modification of the data. In case of discrepancy between a digital-copy of the construction schedule and the corresponding hard-copy of the construction schedule, the hard-copy of the construction schedule bearing the latest date, and that has been formally submitted and reviewed in accordance with the requirements of Section 01 32 16 shall govern.
- .3 Construction schedule:
  - .1 Include the complete sequence of construction activities, including provision for climate and weather.
  - .2 Include the dates for the commencement and completion of each major element of the *Work* parallel to the sections of the specifications.
  - .3 Show projected percentage of completion for each item as of the first *Working Day* of each week.
  - .4 Submit draft schedule for review, and incorporate responses to comments identified by *Consultant* and/or *Owner*.
  - .5 Show dates for the commencement and completion of inspection and testing
  - .6 At each date of submission of schedule, indicate progress of each activity.
    - .1 Show changes occurring since previous submission of the construction schedule:

Construction Progress Documentation

---

- .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.
- .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*.
- .7 Submit revised construction schedule with each application for payment and each progress meeting in accordance with Section 01 31 19.
- .4 *Product* delivery schedule:
  - .1 Include 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.
- .5 Inspection and testing schedule:
  - .1 Prepare schedule for inspection and testing by advance discussion with the selected inspection and testing company to determine the time required for the 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.
- .6 Landscaping schedule:
  - .1 Prepare and submit a landscaping schedule in accordance with Section 32 90 00.

**PART 2 - PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

Photographic Documentation

---

## **PART 1 - GENERAL**

### **1.1 General**

- .1 Provide photographic documentation in digital format and in accordance with procedures and submission requirements specified in this section.

### **1.2 Digital Photographs**

- .1 Equipment: Provide photographs using minimum 10 megapixel digital camera.
- .2 Submit the required photographs to the *Consultant* and to the *Owner*.
- .3 Output: Supply date stamped maximum resolution colour photos to *Consultant* in JPEG format, on CD-ROM format.
- .4 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 which may or may not have occurred during construction: 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.
  - .4 Completion: When the *Work* is completed, arrange to take final photographs of the *Work* from a minimum of 8 points of view.

## **PART 2 - PRODUCTS**

Not applicable.

## **PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

Submittals

---

## PART 1 - GENERAL

### 1.1 General Requirements

- .1 Submit submittals as requested by the *Contract Documents*, as specified herein, and in accordance with the conditions of the *Contract*.
- .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 Procedures and requirements for *Contract* closeout submittals shall be in accordance with the following sections:
  - .1 Section 01 77 00 - Contract Closeout Procedures and Submittals.
  - .2 Section 01 78 36 – Extended Warranties.
- .4 *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*. *Contractor's* 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 *Contractor* shall 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 Submittals that have not been reviewed, checked, and coordinated by *Contractor* prior to submission to *Consultant*, will be rejected.
  - .5 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*.
- .5 *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, or responsibility for meeting requirements of *Contract Documents*.

### Submittals

---

- .2 *Contractor* shall be responsible for dimensions to be confirmed and correlated at the *Place of the Work* for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the *Work*.
- .3 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 drawing reviews.
- .4 *Consultant's* review and markings on submittals do not authorize changes in the *Work* or the *Contract Time*, and will 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 26 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 increase the *Contract Time*.
- .5 Submittals which 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*.
- .6 Make submittals with reasonable promptness and in an orderly sequence so as to cause no delay in the *Work*. Be responsible for delays, make up time lost and pay added costs, at no additional cost to the *Owner*, incurred because of not making submittals in due time to permit proper review by *Consultant*.
- .7 Submittals that contain substitutions will be rejected. Substitutions are permitted only on substitution submittals as specified in Section 01 25 00.
- .8 Do not proceed with work affected by a submittal, including ordering of *Products*, until relevant submittal has been reviewed by *Consultant*.
- .9 Prepare submittals using SI (metric) units.
- .10 *Contractor's* responsibility for errors and omissions in submittals is not relieved by *Consultant's* review of submittals.
- .11 *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.
- .12 Engineered submittals:

### 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 \$1,000,000 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 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*.
- .4 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.
- .5 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.
- .6 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.
- .7 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*.
- .8 Costs for such field reviews and field review reports and letters of general conformity are included in the *Contract Price*.
- .13 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*.
- .14 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*.

### 1.2 Schedule of Submittals

- .1 Before commencement of the *Work*, submit to the *Consultant* a detailed schedule of submittals required by the *Contract Documents*.

### Submittals

---

- .1 Schedule shall be accompanied by a checklist, correlated to each of the schedule of submittals, the construction schedule (specified under Section 01 32 16), the *Product* delivery schedule (specified under Section 01 32 16), and the schedule of inspections and tests (specified under Sections 01 32 16 and 01 45 00), 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 Inspection and testing companies.
  - .5 Demonstration and training.
- .2 Indicate dates for submitting, review time, resubmission time, float time, and last date for meeting construction schedule.
- .3 *Consultant* will review submittal schedule and advise *Contractor* if volume and timing of submittals will permit timely review and response. *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.
- .4 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 Day* review period.
- .5 If the *Consultant* requires resubmission of submittals, allow for an additional 10 *Working Days* review for each resubmission.
- .6 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*.
- .7 The *Contractor* shall periodically resubmit the submittal schedule to correspond to changes in the construction schedule. Such resubmissions shall maintain the minimum 10 *Working Day* period for the *Consultant's* review.
- .8 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*.

## Submittals

---

### 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, in duplicate, containing:
  - .1 Date.
  - .2 *Project* title and number.
  - .3 *Contractor's* name and address.
  - .4 Identification and quantity of each submittal.
  - .5 Other pertinent data.
- .4 Each submittal shall be identified numerically by relevant specification section number with a numeric indicator for multiple submittals by that section followed by revisions number, for example 04 05 19-01-R0.
- .5 Make any changes in submittal that *Consultant* may require, consistent with *Contract Documents* *Contract Documents*, and resubmit as directed by *Consultant*.
- .6 Notify *Consultant*, in writing, when resubmitting, of any revisions other than those requested by *Consultant*.
- .7 After *Consultant's* review, distribute copies to affected parties.

### 1.4 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 prints of reviewed *Product* data sheets for issuance to *Owner* immediately prior to *Substantial Performance of the Work*, in an acceptable, bound manner and in accordance with Section 01 77 00.

### 1.5 Shop Drawings

- .1 Submit shop drawings as follows:

Submittals

---

- .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 3mm (1/8") high.
- .3 Where requirements of *Contract Documents* are more stringent than design proposed on shop drawings, the requirements of the *Contract Documents* take priority.
- .4 *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.
  - .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'.
- .5 Shop drawing 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.
- .6 Upon completion of review by *Consultant*, 1 marked set of shop drawings will be returned to *Contractor* in digital format for reproduction and distribution.
- .7 Retain 1 complete set of prints of reviewed shop drawings for issuance to *Owner* immediately prior to *Substantial Performance of the Work*, in an acceptable, bound manner and in accordance with Section 01 77 00.
- .8 Submit copies of reviewed shop drawings to authorities having jurisdiction as required.
- .9 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 prepared by professional engineer, as required, substantiating sizes for members and connections based on design loads.
  - .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 will 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*.

### Submittals

---

- .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.
- .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 drawing a statement that each *Product* and material indicated on the shop drawing is compatible with each *Product* and material with which it comes into contact.

### 1.6 Certificates and Certification Submittals

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

### 1.7 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* office (TEAL Architects+Planners Inc.).
- .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 Resubmit samples until written acceptance is obtained from *Consultant*.

Submittals

---

## 1.8 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 work of Divisions 21, 22, and 23, and Divisions 26, 27, and 28 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 *Provide* 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.
- .9 Coordination and interference drawings shall be circulated for mark-ups by *Subcontractors* responsible for work of Divisions 3, 5, 9, 11, 14, Divisions 21, 22, and 23, and Divisions 26, 27, and 28.

Submittals

---

- .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*.

**PART 2- PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## Acronyms and Abbreviations

### PART 1 - GENERAL

#### 1.1 Acronyms and Abbreviations

- .1 Acronyms and abbreviations that may be used in the Contract Documents include, but are not limited to, the following:

A/V Barrier	Air Vapour Barrier
AB	Air Barrier
ABV	Above
ACM	Architectural Concrete Masonry
ACP	Acoustic Ceiling Panel
ACT	Acoustic Ceiling Tile
AD	Area Drain
ADD	Addendum
ADDL	Additional
ADJ	Adjacent
ADO	Automatic Door Operator
AFF	Above Finished Floor
ALT	Alternate
AL or ALUM	Aluminum
ANN	Annunciator
ANOD	Anodized
AP	Access Panel
APC	Architectural Precast Concrete
APPROX	Approximate
ARCH	Architectural
ASPH	Asphalt
ASSY	Assembly
ASSOC	Association
ATM	Automatic Teller Machine
AUTH	Authorized
AUTO	Automatic
AV	Audio Visual
AVB	Air Vapour Barrier
AVG	Average
AWG	American Wire Gauge
B/	Bottom (of)
BAL	Balance
BBD	Bulletin Board
BD	Board
BDRM	Bedroom
BEL	Below
BETW	Between
BF(xx)	Barrier Free (xx)
BHD	Bulkhead
BIT	Bituminous
BLKHD	Bulkhead
BLDG	Building
BLK	Block
BLKG	Blocking
BM	Beam
BMK	Bench Mark

BOC	Bottom Of Curb
BOT	Bottom
BPL	Bearing Plate
BR	Brick
BRDG	Bridging
BRKT	Bracket
BS	Both Sides
BSMT	Basement
BTWN	Between
BUR	Built-Up Roof
c/c	centre to centre
c/w	complete with
CA	Cup Anchor - Pool
CAB	Cabinet
CAD	Computer Aided Drafting
CB	Catch Basin
CBLK	Concrete Block
CCTV	Closed Circuit Television
CEM	Cement
CBD	Cement Board
CG	Corner Guard
CH	Coat Hook
CJ	Control Joint
CL	Centre Line
CLG	Ceiling
CIP	Cast In Place
CLR	Clear
CMU	Concrete Masonry Unit
CMU-A	Concrete Masonry Unit Ashlar Unit
CMU-S	Concrete Masonry Unit Split-face Unit
CO	Cleanout (at floor drain)
COL	Column
COMB	Combination
COMP	Composite
CONC	Concrete
COND	Conduit
CONSTR	Construction
CONT	Continuous
CPT	Carpet
CR	Curtain Rod
CSK	Countersink
CT	Ceramic Tile
CTR	Centre
CWL	Curtain Wall
DBL	Double

Acronyms and Abbreviations

DD	Deck Drain
DEMO	Demolition
DEPT	Department
DET(S)	Detail(s)
DF	Drinking Fountain
DFT	Dry Film Thickness
DIA	Diameter
DIAG	Diagonal
DIFF	Diffuser
DIM	Dimension
DISP	Dispenser
DIV	Division
DMT	Demountable
DN	Down
DP	Deep
DR	Door
DRBD	Drainboard
DS	Depth Signage - Pool
DWG(S)	Drawing(s)
EA	Each
EL	Elevation
ELECT	Electrical
ELEV	Elevator
EMER	Emergency
ENCL	Enclosure
ENT	Entrance
EQ	Equal
EQUIP	Equipment
ESC	Escalator
EXH	Exhaust
EXIST	Existing
EXP	Exposed
EXPAN	Expansion
EXT	Exterior
EXTR	Extruded, Extrusion
FD	Floor Drain
FD-T	Floor Drain In Trench
FDN	Foundation
FEC	Fire Extinguisher Cabinet
FF&E	Fixtures, Furnishings & Equipment
FFL	Finished Floor Level
FG	Floor Grille / Foot Grille
FHC	Fire Hose Cabinet
FIN	Finish, Finished
FIXT	Fixture
FL	Floor
FLEX	Flexible
FLUOR	Fluorescent
FPRF	Fireproof
FRR	Fire Resistance Rating
FS	Full Size
FURN	Furniture
FURR	Furring

GA	Gauge
GALV	Galvanized
GF	Ground Face
GFRC	Glass Fibre Reinforced Concrete
GL	Glass
GLULAM	Glue Laminated
GR or GRD	Grade
GRB	Grab Bar
GRND	Ground
GRT	Grout
GWB	Gypsum Wallboard
GWG	Georgian Wired Glass
GYP	Gypsum
HCWD	Hollow Core Wood
HD	Heavy Duty
HDD	Hand Dryer
HDNR	Concrete Hardener
HDPE	High Density Polyethylene
HDWD	Hardwood
HEX	Hexagonal
HID	High Intensity Discharge
HIGB	High Impact Gypsum Board
HK	Hook
HM	Hollow Metal
HORIZ	Horizontal
HPT	High Point
HRD	Hair Dryer
HRDW	Hardware
HSS	Hollow Structural Section
HT	Height
ID or I/D	Inside Diameter
IFP	Intumescent Fireproofing
IGU	Insulated Glass Unit
INCL	Include
INS or INSUL	Insulation
INT	Interior
INTERM	Intermediate
JAN	Janitor
JB	Junction Box
JCT	Junction
JST	Joist
JT	Joint
KPL	Kickplate
L	Angle, Left, Length
LA	Pool Lane Anchor
LAM	Laminated
LAT	Lateral
LAV	Lavatory
LF	Light Fixture
LG	Length
LIBR	Library

Acronyms and Abbreviations

LIN	Linear
LINO	Linoleum
LKR	Locker
LONG	Longitudinal
LOCS	Locations
LPT	Low Point
LTG	Lighting
LVR	Louvre
MACH	Machine
MAINT	Maintenance
MAN	Manual
MAT	Material
MAX	Maximum
MCC	Motor Control Centre
MD	Metal Deck
MDF	Medium Density Fibreboard
MECH	Mechanical
MED	Medium
MEMB	Membrane
MET	Metal
MEZZ	Mezzanine
MFR	Manufacturer
MH	Manhole
MHT	Mounting Height
MIN	Minimum
MIR or MR	Mirror
MISC	Miscellaneous
MLDG	Moulding
MLWK	Millwork
MO	Masonry Opening
MOD	Modified
MSNRY	Masonry
MTD	Mounted
MTL	Metal
MTR	Motor
MUL	Mullion
NA or N/A	Not Applicable
NAT	Natural
NIC	Not In Contract
NO	Number
NOM	Nominal
NRC	Noise Reduction Coefficient
NTS	Not To Scale
OA or O/A	Overall
OC or O/C	On Centre
OF or O/F	Outside Face
OH or O/H	Overhead
OD	Outside Diameter
OPNG	Opening
OPP	Opposite
OR	Outside Radius
OWSJ	Open Web Steel Joist

PA	Public Address
PARTN	Partition
PB	Push Button
PERF	Perforated
PERIM	Perimetre
PERP	Perpendicular
PFN	Prefinished
PKG	Parking
PL or PLT	Plate
PLAM	Plastic Laminate
PLYWD	Plywood
PNL	Panel
POL	Polished
PR	Pair
PREFAB	Prefabricated
PREFIN	Prefinished
PRFMD	Preformed
PROP	Property
PT	Paint (or Point where applicable)
PTBD	Particle Board
PTD	Painted
PTDI	Paper Towel Dispenser
PTN	Partition
PVC	Polyvinyl Chloride
PVMT	Pavement
PWR	Power
QTR	Quarter
QTY	Quantity
R	Radius / Riser
RAD	Radius
RA	Return Air
RB	Resilient Base
RBT	Rabbet
RCP	Reflected Ceiling Plan
RD	Roof Drain
REBAR	Reinforcing Bar
RECT	Rectangular
REF	Reference
REFRIG	Refrigerator / Refrigerated
REINF	Reinforcement
REM	Removable
REQD	Required
RES	Resilient
RET	Return
REV	Revision
RF	Roofing
RFG	Roofing
RFS	Room Finish Schedule
RH	Right Hand
RM	Room
RND	Round
RO	Rough Opening
RTN	Return
RWL	Rain Water Leader

Acronyms and Abbreviations

S4S	Surfaced 4 Sides
SA	Stanchion Anchor - Pool
SAN	Sanitary
SC	Solid Core
SCHED	Schedule
SCWD	Solid Core Wood
SD	Soap Dish
SDI	Soap Dispenser
SECT	Section
SHW	Shower
SIM	Similar
SJS	Silicone Joint Sealant
SKL	Skylight
SLV	Sleeve
SND	Sanitary Napkin Dispenser
SNR	Sanitary Napkin Receptor
SNV	Sanitary Napkin Vendor
SPEC	Specification
SPK	Speaker
SPL	Solid Plastic Laminate
SPH	Solid Phenolic
SSF	Solid Surfacing Sheet
SST	Stainless Steel
STC	Sound Transmission Class
STD	Standard
STL	Steel
STOR	Storage
STRUCT or STRL	Structural / Structure
SUR	Surface
SUSP	Suspended
SYM	Symmetrical
SYS	System
T&B	Top And Bottom
T&G	Tongue And Groove
T/O	Top Of
TB	Towel Bar
TD	Trench Drain
TEMP	Temperature, Temporary, Tempered
TH or THK	Thick / Thickness
THRESH	Threshold
TKS	Tackable Surface
TL	Tile
TOC	Top Of Curb
TPH	Toilet Paper Holder
TPS	Toilet Partition System
TR	Transom
TRD	Tread
TRZ	Terrazzo
TYP	Typical
U/S	Underside
UC or U/C	Undercut

UNEXC	Unexcavated
UNFIN	Unfinished
UNO	Unless Noted Otherwise
UR	Urinal
UTIL	Utility
VB	Vapour Barrier
VERT	Vertical
VEST	Vestibule
W/	With
W/O	Without
WC	Watercloset
WD	Wood
WF	Wide Flange
WP	Waterproofing
WPT	Working Point
WT	Weight
WDS	Wood - Solid
WDV	Wood Veneer
WWF	Welded Wire Fabric

#### Acronyms and Abbreviations

---

- .2 Refer to the various parts of the *Contract Documents* for additional abbreviations and acronyms not listed above.

#### **PART 2- PRODUCTS**

Not applicable.

#### **PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Section Includes**

- .1 General administrative and procedural requirements for quality assurance and quality control as specified elsewhere in the *Contract Documents*.

### **1.2 Related Requirements**

- .1 Pre-installation meetings: in accordance with Section 01 31 19.
- .2 Materials and workmanship quality assurance and reference standards: in accordance with Section 01 60 00.
- .3 Balancing and testing of systems - under Divisions 21, 22, and 23, and Divisions 26, 27, and 28.

### **1.3 Contractor's Quality Assurance Program**

- .1 Submit to the *Owner* and the *Consultant* for their review, a quality assurance program (the "Quality Assurance Program").
- .2 The Quality Assurance Program shall already be in use by the *Contractor* and shall meet the requirements of Canadian Standards Association CSAZ299.3 or such other requirements as set out in the *Contract Documents*.
  - .1 It shall be designed so that all quality requirements are obtained by progressive implementation of the controls and inspection functions stated in the Quality Assurance Program.
  - .2 The *Contractor* shall make any modifications to the Quality Assurance Program as are 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 all purchased or manufactured materials to be identified, inspected to the specified standard, and covered by a material test report.
    - .3 A system by which all measuring and testing equipment is properly stored, handled, and calibrated to a known standard.
    - .4 A system by which all incoming materials is 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 all 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.
    - .7 A system by which non-conformance to requirements of the *Contract Documents* shall be recorded and all solutions proposed by the *Owner* or the *Consultant* are also recorded.

#### Quality Control

---

- .8 A system by which all equipment shall be given handling and storage instructions.
  - .9 A system by which all SBO items (items supplied by *Owner*) 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.
  - .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 The *Contractor* shall provide the *Owner* and the *Consultant* with regular Quality Assurance Reports according to an agreed schedule.

#### 1.4 Contractor's Field Quality Control

- .1 The *Contractor* is responsible for field quality control of the *Work* including quality control of *Subcontractors* and material *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 sufficient inspections and tests of all items of work, including those of *Subcontractors*, to ensure compliance with *Contract Documents*.
- .4 Furnish appropriate facilities, instruments, and testing devices required for performance of the quality control function.
- .5 Required certificates of inspection testing or approval shall be secured by the *Contractor* and delivered to the *Owner* in such time as not to delay progress of the *Work*.
- .6 The *Contractor* shall develop a field quality control manual covering both factory and field installation. The form of the manual shall be reviewed and accepted by the *Consultant*. This manual will document quality control practices of the *Contractor*, *Subcontractors*, and major *Suppliers*. The manual shall include, but not be limited to, specific criteria related to:
  - .1 Concrete slab moisture and pH testing and surface preparation, including flatness and levelness.
  - .2 Surface preparation.
  - .3 Fastener and anchor installation.
  - .4 Air barrier continuity: identify continuity of air barrier systems, including joints and overlapping of dissimilar systems.
  - .5 Air barrier, adhesion testing.
  - .6 Sealant mixing, tack time, set time.
  - .7 Sealant staining of porous substrate testing.
  - .8 Sealant adhesion testing, including butterfly tests where applicable.
  - .9 Painting, verification and adhesion testing where required.
  - .10 Material compatibility testing.

## Quality Control

---

- .11 On line fabrication quality control practices.
- .12 Shipping.
- .13 Field installation.
- .14 Field inspection and testing (by *Contractor*).
- .15 Field inspection and testing (independent).
- .7 The *Contractor* 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, where applicable, linked to daily production. The form of this logbook shall be reviewed and accepted by the *Consultant*.

### 1.5 Inspection and Testing – Owner’s Quality Control

- .1 Inspection and testing services will be used to verify compliance with requirements of the *Contract Documents*. These services do not relieve the *Contractor* of responsibility for compliance with the *Contract Documents*.
  - .1 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.
  - .2 Requirements for the *Contractor* to provide quality control services required by *Consultant*, *Owner*, or authorities having jurisdiction are not limited by provisions of this section.
- .2 The *Owner* will appoint inspection and testing companies, representing, reporting and responsible to the *Owner*. Payment will be by *Owner*, unless otherwise specified.
- .3 Additional testing services required because of changes in materials, proportions of mixes requested by *Contractor* or *Subcontractors* as well as additional testing services for materials occasioned by lack of identification or by failure of such materials being replaced to meet requirements of the *Contract Documents* or testing of structure or elements including load testing, shall be carried out at no additional cost to the *Owner*.
- .4 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* and not be paid by *Owner*, unless otherwise specified in the *Contract Documents*.
- .5 Inspection or testing performed exclusively for *Contractor’s* convenience shall be sole responsibility of *Contractor*, and will not be paid by *Owner*.
- .6 Inspection and testing shall be performed by company qualified to perform the inspections or tests specified or required.
- .7 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.
- .8 Cooperation with inspection and testing companies:
  - .1 Provide inspection and testing companies with materials and installation information as required and /or requested.

Quality Control

---

- .2 Provide access to the *Work* for representatives of inspection and testing companies.
- .3 Cooperate with inspection and testing companies and give adequate notification of any changes in source of supply, additional work shifts and other proposed changes.
- .4 Permit access to the *Work* for inspection and testing companies wherever the *Work* is in progress, or wherever *Products*, materials, or equipment are stored prior to shipping.
- .5 Supply labour required to assist inspection and testing companies in sampling and making tests.
- .6 Repair work damaged as a result of inspection and testing work.
- .7 Inspection and testing company services do not relieve the *Contractor* of responsibility for normal shop and site inspection, and quality control of manufacturing and installation.
- .9 Where evidence exists that defective workmanship may have occurred, or that the *Work* may have been carried out incorporating defective materials, or tests demonstrate that installed conditions do not comply with the requirements of the *Contract Documents*, the *Consultant* reserves the right to have appropriate inspections, tests, and surveys performed, analytical calculation of structural strength made and the like 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*.
- .10 Prepare schedule for inspection and testing company services in accordance with Section 01 33 00 and as follows:
  - .1 Establishing schedule:
    - .1 By advance discussion with the selected 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 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 inspection and testing company, but shall be no less than 2 *Working Days*.
    - .2 When 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 Control

---

- .3 Notify 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 Give 2 *Working Days* prior notice to inspection and testing company of the commencement of each phase of the *Work* requiring inspection, and provide inspection and testing company with materials and installation information.
- .11 Reports and documents
- .1 Inspection and testing company shall submit shop inspection and site inspection reports within 5 *Working Days* of each inspection.
  - .2 Distribute reports as follows:
    - .1 *Owner*, 2 copies.
    - .2 *Consultant*, 1 copy.
    - .3 *Contractor*, 2 copies.
    - .4 Consulting engineers, as applicable; 1 copy each.
  - .3 Inspection and testing companies 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 *Product* assembly fails to meet requirements of the *Contract Documents*.
  - .4 Upon completion of portions of the *Work* subject to independent inspection and testing, submit to the *Consultant* duplicate certificates of acceptance of the installation issued by the independent inspection and testing company.
- .12 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*.
  - .2 Specimens and samples for testing, unless otherwise specified in the *Contract Documents*, will be taken by the inspection and testing company; sampling equipment and personnel will be provided by the inspection and testing company; and deliveries of specimens and samples to the testing company will be performed by the testing company unless otherwise specified.
  - .3 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.

Quality Control

---

- .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).

## 1.6 Mock-Ups

- .1 *Provide* field or shop erected example of work complete with specified materials and workmanship.
- .2 Erect mock-ups at locations as specified and as acceptable to *Consultant*. Do not proceed with work for which mock-ups are required prior to *Consultant's* review of mock-ups.
- .3 Protect and maintain mock-ups until directed to be removed. Commence work demonstrated in mock-up only after review and acceptance of workmanship. If possible, mock-up may become part of finished work, at sole discretion, and with prior written acceptance of *Consultant*.
- .4 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be compared.
- .5 Remove and replace materials or assemblies not matching reviewed mock-ups.
- .6 Resubmit mock-ups until written acceptance is obtained from *Consultant*.

## 1.7 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 ensure that work is being executed in accordance with manufacturer's written recommendations and verify its product to be fit-for-purpose intended.
- .2 Manufacturer's field review is to ensure that the *Products* specified are being used in the *Work* and are being applied on surfaces prepared in accordance with their recommendations and the requirements of the *Contract Documents*.
- .3 Unless otherwise indicated, manufacturer's representative shall undertake a minimum of 2 field reviews generally, 5 field reviews minimum for roofing and waterproofing, with additional reviews as deemed necessary by the manufacturer, to determine that the work of such sections is in accordance with the manufacturer's written recommendations.
- .4 Manufacturer's representative shall submit a type-written report on manufacturer's letterhead within 2 *Working Days* after each field review. Report shall document manufacturer's representative's field observations and recommendations.
- .5 Manufacturer's field review reports shall be prepared and distributed following the procedures specified for preparation and submittal of inspection and testing reports given above.

## 1.8 Radiometric Infrared Thermographic Scanning/Analysis, Air Leakage Tests

- .1 Radiometric infrared thermographic scanning/analysis:
  - .1 Thermographic analysis will be done to evaluate installed building assemblies and equipment. Analysis will include the following installed components of the *Work*:
    - .1 Air infiltration and exfiltration through building envelope assemblies.
    - .2 Moisture accumulation in building envelope assemblies.

Quality Control

---

- .3 Insulation and thermal performance continuity in the building envelope assemblies.
- .4 Mechanical assemblies.
- .5 Electrical assemblies.
- .2 Analysis shall be performed by independent inspection and testing company.
- .2 Air leakage testing:
  - .1 Air leakage testing will be done to evaluate installed air barrier assemblies.
  - .2 Testing shall be performed by independent inspection and testing company.

**PART 2 - PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

Temporary Facilities and Controls

---

## **PART 1 - GENERAL**

### **1.1 General Instructions**

- .1 Arrange, obtain and pay cost for permits required for temporary facilities and controls.
- .2 *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*.
- .3 Arrange and pay for required temporary services, unless otherwise indicated by *Consultant*.
- .4 Do not use permanent mechanical, or electrical systems 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.
- .5 *Provide* connection and disconnection of temporary services and facilities required in the *Work*.

### **1.2 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*.
- .2 *Provide* and maintain any components and equipment necessary to transform supply power to necessary temporary power voltage.

### **1.3 Temporary Water Supply**

- .1 *Provide* and maintain a temporary supply of water for use in the *Work*.
- .2 Extend supply pipe or pipes from nearest available sources and maintain in good condition until permanent system is installed and ready for use.

### **1.4 Temporary Sanitary Facilities**

- .1 *Provide* and maintain temporary sanitary facilities for use by workers.
- .2 Use of new building's sanitary facilities by workers is prohibited.

### **1.5 Temporary Site Offices**

- .1 *Provide* heated, lighted, air conditioned and ventilated site office, of sufficient size to accommodate site meetings for a minimum of 12 people comfortably, and furnished with drawing layout table, filing cabinets, telephone, and computer as described below.

### **1.6 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 *Provide* and maintain a computer for the purposes of email and internet access. Computer to have dedicated, high-speed access, and be *Provided* complete with a printer capable of printing 11" x 17" format.

Temporary Facilities and Controls

---

## 1.7 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 Ventilate to the exterior of the building work areas as required when toxic materials are being utilized or cured.
- .8 Replace with new, any work damaged due to failure to provide adequate heat at no cost to *Owner*.

## 1.8 Temporary Enclosures and Protection

- .1 *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.
- .2 Temporary enclosure and protection shall be of finished appearance and painted to colour approved by *Owner*.

## 1.9 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 Sign shall be professionally painted according to the design provided by *Consultant*.

Temporary Facilities and Controls

---

- .4 Location of sign: In prominent location to *Consultant* acceptance.
- .2 *Consultant* signs:
  - .1 Install at the *Place of the Work* corporate signs as provided by *Consultant*.
  - .2 Location of sign: In prominent location to *Consultant's* acceptance.
  - .3 Mount sign on suitable supports.

**1.10 Plant, Machinery and Scaffolding**

- .1 *Provide* formwork, scaffolding, equipment, tools, machinery 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.

**1.11 Site Storage**

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

**1.12 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.

**1.13 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*.

Temporary Facilities and Controls

---

- .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 plywood protection to stair treads, until Substantial Performance of the Work.

**1.14 Protection of Foundations**

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

**1.15 Protection of Concrete Floors to Remain Exposed in Finished Work**

- .1 Non-marking protection material shall be placed over concrete floors designated as exposed.
- .2 Post the following on warning signs at locations leading to areas of where concrete floors are to remain exposed in finished work (see Concrete Floor Contractors Association of Canada):
  - .1 Concrete floors shall be protected from staining, damage and excessive loading at all times:
    - .1 No traffic is permitted on new concrete floors for the first 3 days after placement.
    - .2 Foot traffic is permitted between 3-7 days after placement (curing materials must be replaced where disturbed by traffic).
    - .3 Scissorlifts and light equipment are permitted 7 days after slab placement.
    - .4 Vehicles shall be diapered to prevent oil and other liquid spills (remove leaking equipment from the jobsite immediately).
    - .5 Tires shall be non-marking or taped with non-marking tape to prevent marking of the floors.
    - .6 Trucks, forklifts and any other heavy loads may only to be placed on the floor if they have been previously approved by the *Consultant*.
    - .7 Spills must shall be cleaned up immediately to avoid permanent staining of the concrete.
    - .8 Concrete shall be protected from scratching and impact damage at all times. No cutting, painting, welding or other injurious activities shall be performed without protecting the concrete from damage prior to the commencement of work.

**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 and 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 eliminate tracking of soil off the *Place of the Work*. If the loading point becomes contaminated, it shall be cleaned and replaced.
- .2 Vehicles leaving the *Place of the Work* shall be cleaned of loose soil and dust, including tire washing, and sweeping or washing of exteriors and tailgates by a designated labourer.
- .3 Keep a daily log of each vehicle leaving the *Place of the Work*, including time of cleaning and name of cleaner.
- .4 Tarp vehicles containing indigenous soil or debris leaving the *Place of the Work*.
- .5 The *Contractor* shall clean adjacent and joining streets and property should the *Contractor* fail to contain all soil and debris resulting from the *Work* within the *Place of the Work*.

**1.20 Waste Management**

- .1 Refer to Section 01 10 00 for requirements for waste disposal.
- .2 Do not bury rubbish and waste materials at the *Place of the Work*.
- .3 Do not dispose of waste into waterways or storm or sanitary sewers.
- .4 Do not burn waste materials at the *Place of the Work*.

Temporary Facilities and Controls

---

- .5 Comply with waste disposal requirements of authorities having jurisdiction.
- .6 Remove waste material from the *Place of the Work* daily. If waste is collected in bins, bins to be removed from site once full.
- .7 Arrange and pay for removal of debris and waste from the *Place of the Work*.
- .8 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Pay applicable fees, unless waived in writing by the *Owner*.

**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 Abide by the Municipality of the District of East Hants Noise By-Laws.

**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 *Provide* a hard surface area at the *Place of the Work* for cleaning down trucks prior to entry onto municipal roads or private roads outside of the *Place of the Work*.
- .3 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*.
- .4 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 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.
- .2 *Provide* and maintain security lighting.
- .3 *Provide* and maintain temporary locks. Premises to be locked after working hours.
- .4 At commencement of the work of finishing trades, employ a security guard to attend the *Place of the Work* after working hours until date of *Substantial Performance of the Work*.

## **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.
- .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.

Temporary Facilities and Controls

---

- .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*.
  - .3 Comply with manufacturer's written instructions 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 F2170-16a, 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 ft<sup>2</sup>/24 hrs by 97% in one coat. System must be able to perform as required with RH Probe readings of 100%
- .8 Manufacturer's which 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 instructions and recommendations.
- .2 Field Quality Control:
  - .1 Conduct quality control in accordance with Section 01 45 00 and as follows:
    - .1 Field tests and inspections:

Temporary Facilities and Controls

---

- .1 Test for moisture vapour transmission in accordance with ASTM F710-11 and ASTM F1869-16 or ASTM F2170-16a in accordance with manufacturer's written flooring installation instructions. 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 F1869-16, or exceed 75% when tested to ASTM F2170-16a.
  - .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 F710-11.
  - .3 For each test type: Conduct 3 tests for flooring applications up to  $93 \text{ m}^2$  (1000 square feet) in area, and 1 additional test for each additional  $93 \text{ m}^2$  (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**

Product Requirements

---

## PART 1 - GENERAL

### 1.1 Availability of Products

- .1 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*.

### 1.2 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:
  - .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. *Products* used for temporary facilities may have been previously used, providing they are sound in structural qualities.

Product Requirements

---

- .2 *Products* and *Product* installation shall be in compliance with building code, regulations and requirements of authorities having jurisdiction.
- .3 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 Where only one manufacturer's trade name is specified for a *Product*, the *Product* is single sourced and shall be supplied by the specified manufacturer.
  - .2 Where more than one manufacturer's trade name is specified for a *Product*, supply one *Product* from list of *Products* specified.
  - .3 When a *Product* is specified by reference to a standard, select one *Product* from manufacturer that meets or exceeds the requirements of the standard and manufacturer's written application directions.
  - .4 When a *Product* or system is specified by prescriptive or performance specifications, *Provide* one *Product* or system which meets or exceeds the requirements of the prescriptive or performance specifications and manufacturer's written application directions.
  - .5 The onus is on the *Contractor* to prove compliance with governing published standards, prescriptive specifications and with performance specifications.
  - .6 Visual selection specification:
    - .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 color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
  - .7 Visual matching specification:
    - .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.
- .4 *Products*, materials, equipment and articles (referred to as *Products* throughout the *Contract Documents*) incorporated in the *Work* shall be new, not damaged or defective, and of the quality standards specified, for the purpose intended. If requested, furnish evidence as to type, source and quality of *Products Provided*.
- .5 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.

Product Requirements

---

- .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.
- .6 Where *Contract Documents* list acceptable *Products* or acceptable manufacturers, select as applicable, one *Product* meeting performance of specifications and manufacturer's written application directions.
- .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 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 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.
- .9 Should dispute arise as to quality or fitness of *Products*, the decision rests strictly with *Consultant* based upon the requirements of the *Contract Documents*.
- .10 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*.
- .11 *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.
- .12 Permanent labels, trademarks and nameplates on *Products* are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical, electrical, machinery or like rooms.
- .13 *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 01 33 00 for such selection.
- .14 Quality control:
  - .1 Implement a system of quality control to ensure compliance with *Contract Documents*.
  - .2 Notify *Consultant* of defects in the *Work* or departures from intent of *Contract Documents* that may occur during construction. *Consultant* will recommend appropriate corrective action in accordance with requirements of the *Contract*.
- .15 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.

## 2.2 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.

## Product Requirements

---

- .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 Metal fastenings shall be uniform to metals materials and components being anchored or of a metal which will not set up a galvanic action causing damage to the fastening or metal component under moist conditions.
- .6 Fastenings for prefinished materials shall be of concealed type unless otherwise indicated, and when exposed finish is required, of matching prefinishing materials.
- .7 Metal fastenings and accessories shall be same texture, colour and finish as material on which they occur, as selected by *Consultant*.
- .8 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.

## PART 3 - EXECUTION

### 3.1 Manufacturer's Instructions

- .1 Unless otherwise indicated in the *Contract Documents*, install or erect *Products* in accordance with manufacturer's printed instructions. Do not rely on labels or enclosures supplied with *Products*. Obtain printed instructions directly from manufacturers.
- .2 Notify *Consultant* in writing, of conflicts between the *Contract Documents* and manufacturer's instructions.
- .3 Improper installation or erection of *Products*, due to failure in complying with these requirements, authorizes *Consultant* to require removal and re-installation at no additional cost to the *Owner*.
- .4 Manufacturers' representatives shall have access to the *Work* at all times. *Contractor* shall render assistance and facilities for such access in order that the manufacturers' representatives may properly perform their function.

### 3.2 Overloading

- .1 Protect the building from loads which may cause permanent deformation.
- .2 Protect the *Work* from loads which may cause permanent deformation.

## Product Requirements

---

### 3.3 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 (rainwater or condensation) exists.

### 3.4 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.

### 3.5 Product Installation Requirements

- .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.
  - .3 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*.
  - .4 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 Concealment:
  - .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

Product Requirements

---

- .2 Before installation, inform *Consultant* of any contradictory situation. Install as directed by *Consultant*.
- .5 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. Obtain permission from *Consultant* before commencing any cutting. Refer also to requirements of Section 01 73 29.
- .6 Location of fixtures:
  - .1 Consider location of fixtures, access panels, outlets and mechanical and electrical items indicated as approximate only. Locate fixtures, and the like approximately; Architectural drawings will relate these items to known dimensions, such as ceiling tile grid or wall locations and the like.
  - .2 Obtain *Consultant's* acceptance for precise locations of fixtures, access panels, outlets, mechanical, and electrical items.
  - .3 *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.
  - .4 Inform *Consultant* of conflicting installations. Install only as directed by *Consultant*.
- .7 Protection of work in progress:
  - .1 Take reasonable and necessary measures, including those required by authorities having jurisdiction, to *Provide* protection.
  - .2 Adequately protect parts of the *Work* completed or in progress. Parts of the *Work* damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the *Consultant*, at no additional cost to the *Owner*.
  - .3 Prevent overloading of any part of the building. Do not cut, drill or sleeve any load bearing structural member without written permission of *Consultant*, unless specifically indicated. Refer also to Section 01 73 29.
  - .4 Adequately protect finished flooring from damage. Take special measures when moving heavy loads or equipment on them.
  - .5 Keep floors free of oils, grease or other materials likely to discolour them or affect bond of applied surfaces.
  - .6 Protect work of other *Subcontractors* from damage while doing subsequent work. Damaged work shall be made good by appropriate *Subcontractors* but at expense of those causing damage.
  - .7 Protect existing buildings, curbs, roads and lanes. If, during the *Work*, any buildings, curbs, roads or lanes are damaged, bear costs for repairs.
- .8 Existing utilities:
  - .1 When breaking into or connecting to existing 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.

Product Requirements

---

- .2 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in a manner approved by authority having jurisdiction and stake or otherwise record location of capped service.
- .9 Protection of mechanical and electrical *Products* or materials:
  - .1 Wrap in protective plastic and seal mechanical and electrical items of mechanical and electrical 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*.
- .10 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 instructions.
- .11 Alterations:
  - .1 Restore new or existing work which is altered by new work and make good. Materials and installation quality shall be 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 distance of 1830 mm (6').

**END OF SECTION**

Cutting and Patching

---

## PART 1 - GENERAL

### 1.1 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:
    - .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.
  - .3 Include in request:
    - .1 Identification of *Project*.
    - .2 Location and description of affected work.
    - .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: Radiography (X-ray) imaging of work to be cut or cored.
  - .4 Do not commence cutting, patching, or remedial work until request has been reviewed by *Consultant*.
- .2 Preparation:
  - .1 Inspect existing conditions, 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 assure structural integrity of surroundings; 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; maintain excavations free of water.

### Cutting and Patching

---

- .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 Execution:
  - .1 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.
  - .2 Remove and replace defective and non-conforming work.
  - .3 Remove samples of installed work for testing if directed by *Consultant*.
  - .4 Shop drawings identifying precise locations and size of openings to be cored and cut are to be submitted for review by *Consultant*. *Provide* non-destructive structural survey of structural concrete to be cored or cut, for *Consultant* review. Coring and cutting work locations shall be reviewed by *Consultant* for acceptance before proceeding.
  - .5 *Provide* openings in non-structural elements of the *Work* for penetrations of mechanical and electrical work
  - .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 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*.
  - .9 Restore work with new *Products* in accordance with requirements of *Contract Documents*.
  - .10 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and with suitable allowance for deflection, expansion, contraction, and firestopping.
  - .11 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.
  - .12 Completely seal voids of penetrations of fire rated wall, ceiling, and floor constructions with firestopping and smoke seals.
  - .13 Refinish surfaces to match adjacent finishes. Refinish continuous surfaces to nearest intersection. Refinish entire assembly units.

## PART 2 - PRODUCTS

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

Progressive Cleaning

---

## **PART 1 - GENERAL**

### **1.1 Environmental Controls**

- .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.
- .4 Provide adequate ventilation during use of volatile or noxious substances.

### **1.2 Materials**

- .1 Use only cleaning materials recommended by manufacturer of surface to be cleaned and as recommended by cleaning material manufacturer.

### **1.3 Cleaning During Construction**

- .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* 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 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*.
- .5 Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.
- .6 Promptly as the *Work* proceeds, on a daily basis and upon completion, clean up and remove rubbish, surplus materials and equipment.
- .7 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.
- .8 Wash exposed surfaces with a cleaning solution approved by *Product* manufacturers.
- .9 Debris and waste not permitted within cavities of *Work*.

## **PART 2 - PRODUCTS**

Not applicable.

## **PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 General Instructions**

- .1 The procedures for completing *Contract* and acceptance by the *Owner* shall be in accordance with CCDC 2 – 2008, as amended, and the methods prescribed by *Owner*.
- .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*.

### **1.2 Cleaning Prior to Substantial Performance of the Work**

- .1 Immediately prior to *Consultant's* review to determine if *Substantial Performance of the Work* has been achieved, remove surplus *Products* and construction machinery and equipment not required for the performance of the remaining *Work* and clean as described under paragraph 1.3 - Final Cleaning 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.

### **1.3 Final Cleaning**

- .1 Environmental controls:
  - .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.
  - .4 Provide adequate ventilation during use of volatile or noxious substances.
- .2 Materials:
  - .1 Use only cleaning materials recommended by manufacturer of surface to be cleaned and as recommended by cleaning material manufacturer.
- .3 Final cleaning:
  - .1 Remove waste *Products* and debris other than that caused by the *Owner*, and leave the *Work* clean and suitable for occupancy by *Owner*.
  - .2 When the *Contract* is completed, remove surplus *Products*, tools, construction machinery and equipment.
  - .3 Clean glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, prefinished surfaces, and fixtures.
  - .4 Remove stains, spots, marks and dirt from decorative parts of the *Work*, electrical and mechanical fixtures, furniture fittings, walls, and floors.
  - .5 Vacuum clean and remove dust from building interiors, behind grilles, louvres, and screens. Vacuum clean interior of electrical equipment.

Contract Closeout Procedures and Submittals

---

- .6 Clean floor finishes to recommendations of manufacturer.
- .7 Remove non-permanent labels.
- .8 Remove dirt and residue from surfaces.
- .9 Inspect finishes, fittings and equipment and ensure specified workmanship and operation.
- .10 At completion of the *Work*, remove protective coatings, clean surfaces and remove excess compounds and sealant materials. Make good defective, scratched or damaged work.
- .11 Broom clean and wash exterior walks, steps and surfaces.
- .12 Remove dirt and other disfigurations from exterior surfaces.
- .13 Clean and sweep roofs, gutters, areaways, downspouts, and drainage systems.
- .14 Sweep and wash clean paved areas at the *Place of the Work*.
- .15 Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.
- .16 Remove seal wrap on mechanical and electrical *Products* and materials and clean as required.
- .17 Clean and/or replace lamps, light fixtures, lenses and grilles.
- .18 Remove protective covering and labels from lamps, hardware, and speciality items.
- .19 Under the direction of the *Consultant*, aim adjustable luminaires .
- .20 Clean architectural concrete to remove surface discolouration, efflorescence and the like. Use a suitable cleaning agent which will not itself stain the surfaces or mar the texture through chemical reaction.
- .21 Clean architectural metal surfaces to remove surface discolouration and rust staining.

#### 1.4 Closeout Submittals

- .1 Collect reviewed submittals, and assemble required closeout submittals executed by *Subcontractors*, *Suppliers*, and manufacturers. Prior to submitting closeout submittals to the *Consultant*, undertake the following:
  - .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.

Contract Closeout Procedures and Submittals

---

- .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*.
- .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, including, but not limited to, reviewed shop drawings, *Product* data sheets, samples, operating instructions, as-built records, fully executed warranties and guarantees, reports recording demonstration and instruction provided to *Owner* for operation and maintenance of building systems, software required for operation and maintenance of building systems, maintenance materials, and keys.
- .3 For equipment put into use with *Owner's* permission during the *Work*, submit required closeout submittals within 10 *Working Days* after start-up.
- .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*.
- .6 As-built documents:
  - .1 *Contractor* to print 1 hard copy set of *Contract Documents* for as-built documentation purposes, the cost for which is included in the *Contract Price*.
  - .2 Accurately record as-built conditions and deviations from *Contract Documents* as the *Work* progresses.
  - .3 Mark changes in red ink.
  - .4 Record, without being limited to, the following:
    - .1 Survey of as-built conditions and survey logs prepared by the registered land surveyor responsible for setting out the work and field engineering.
    - .2 Depths of various elements of foundation in relation to survey datum.
    - .3 Horizontal and vertical location of utilities and appurtenances referenced to permanent surface improvement.
    - .4 Other underground installations and services set beneath slabs-on-grade referenced to visible and accessible features of structure.
    - .5 'As-built' elevations of paving, sidewalks, manholes and catchbasins.
    - .6 Field changes of dimensions/details.
    - .7 Changes by *Change Orders*, *Change Directives*, *Supplemental Instructions*, and RFIs not resolved by one for the preceding instruments.
    - .8 Locations of interior mechanical and electrical equipment and distribution.
    - .9 Elevations and location depths of services. Identify type and size of service and materials used.

Contract Closeout Procedures and Submittals

---

- .10 Specification as-builts: Record as-built *Products*, including manufacturer, manufacturer's model or system number.
- .5 As-built documentation:
  - .1 Submit 4 copies of as-built documents in hard copy.
  - .2 In addition, submit digital scanned copy ("PDF" files) of as-built documents. Submit using digital storage medium or transfer process acceptable to the *Consultant* and the *Owner*.
  - .3 Refer to Section 13 31 13 for additional requirements for as-built documentation for pool installations.
- .7 Operation and maintenance manuals:
  - .1 Submit operation and maintenance manuals, consisting of the following general components:
    - .1 Operation and maintenance book.
    - .2 Shop drawing book.
    - .3 Warranty book.
    - .4 *Project* data book.
    - .5 Maintenance manuals and service data for pools.
  - .2 Submit operation and maintenance manuals as follows:
    - .1 Submit 4 copies of operation and maintenance manuals in hard copy.
    - .2 In addition, submit digital copies ("PDF" files) of operation and maintenance manuals. Submit using digital storage medium or transfer process acceptable to the *Consultant* and the *Owner*.
  - .3 Operation and maintenance books shall contain operating and maintenance data and information specified below for supplied *Products*, in English, and shall be made up as follows:
    - .1 Charts, diagrams and reports identified in Divisions 21, 22, and 23 and Divisions 26, 27, and 28 of the specifications.
    - .2 Description, operation and maintenance instructions for equipment and parts list. Indicate nameplate information such as make, size, capacity, serial number.
    - .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 break-down. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.
    - .6 Neatly type lists and notes. Use clear drawings, diagrams of manufacturers' literature.
  - .4 Shop drawing book:

Contract Closeout Procedures and Submittals

---

- .1 Submit one copy of each final accepted shop drawing 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 drawing in the shop drawing manual.
- .5 Warranty book:
  - .1 Submit copies of bonds, guarantees, warranties and extended warranties together in one report binder, complete with an indexed summary list of warranties and expiration dates. Warranties to be in accordance with Section 01 78 36.
- .6 *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 below in this section.
  - .6 Key construction photos.
  - .7 Permits and forms:
    - .1 Workers' Compensation Board of Nova Scotia Clearance Letter.
    - .2 Certificates of approval of the *Work* by local building department (if available).
    - .3 Electrical authority certificate of inspection.
    - .4 Occupancy Permit.
- .7 Maintenance manuals and service data for pools: in accordance with Section 13 31 13.
- .8 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.

Contract Closeout Procedures and Submittals

---

- .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.
- .9 Maintenance materials:
  - .1 Provide overage, extra stock, and maintenance materials. For required materials, see individual sections of specifications. Deliver to a location and at a time specified by the *Owner*, and as follows:
    - .1 Use unbroken cartons, or if not supplied in cartons, material shall be strongly packaged.
    - .2 Clearly mark cartons or packaging as to contents, project name, and *Supplier*.
    - .3 If applicable give colour and finish, room number or area where material is used.
    - .4 Include necessary information for re-ordering of materials as part of packaging of materials.
  - .2 Replace incorrect or damaged maintenance materials delivered to *Owner*, including damage through shipment.
  - .3 Provide a typed inventory list of maintenance materials prior to *Substantial Performance of the Work* application. List all items, complete with quantities, and storage locations.
  - .4 Establish 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*.

## 1.5 System Demonstration and Project Commissioning

- .1 The *Owner* has engaged an independent commissioning agent for this project.
  - .1 *Contractor* and *Subcontractors* are to designate individuals who will be assigned to commissioning activities and will attend commissioning meetings.
  - .2 Refer also to requirements of Section 01 91 13, Section 13 11 13, Divisions 21, 22, and 23, and Divisions 26, 27, and 28 with respect to commissioning for pool systems, control systems, and mechanical / electrical systems.
- .2 Perform system demonstration and commissioning work 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.
- .3 Submit required certificates of approval or acceptance from authorities having jurisdiction.
- .4 Meet with other consultants; structural, mechanical, electrical, to coordinate demonstration, instruction, commissioning and completion.

Contract Closeout Procedures and Submittals

---

- .5 Review condition of equipment such as lighting, elevators and heating system, which has 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.
- .6 When partial occupancy of uncompleted project is required by *Owner*, coordinate *Owner's* uses, requirements, access, and the like, with *Contractor's* requirements to complete the *Work*.
- .7 Demonstration and instruction:
  - .1 Demonstrate operation of each system to *Owner* and *Consultant*.
  - .2 Instruct *Owner's* personnel in operation, adjustment 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.
  - .4 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*. Support shall be available in the English language.
  - .5 Prepare and insert additional data in the operation and maintenance data manuals when the need for additional data becomes apparent during demonstration or instruction.
  - .6 Demonstration and instruction report: Submit a written report of such demonstration, instruction, and commissioning to the *Consultant* as part of the contract closeout submittals described earlier in this section. Report shall include time and date of each demonstration, instruction, and commissioning activity, complete with a list of persons present.
- .8 Correct deficiencies and defects identified during demonstration, instruction, or commissioning.
- .9 Attend 'end-of-work' testing and break-in or start-up demonstration.

**1.6 Substantial Performance of the Work**

- .1 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.

Contract Closeout Procedures and Submittals

---

- .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 this section, 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.
- .2 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 Builders' Lien Act.
- .3 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.

Contract Closeout Procedures and Submittals

---

- .6 Money shall be withheld for deficiency work and will be released only when all deficiencies have been completed. No partial payment to be recognized until all work is completed.

**1.7 Warranty Period**

- .1 Provide on-going review and attendance to building call-back, maintenance and repair problems during the warranty periods.
- .2 Participate in additional warranty period meetings with the *Owner* as scheduled by the *Owner*. Purpose is to review the building and its systems to identify deficiencies which are to be rectified under the warranty.
- .3 At the beginning of the 12<sup>th</sup> month after *Substantial Performance of the Work*, 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**

Extended Warranties

---

## PART 1 - GENERAL

### 1.1 Extended Warranties

- .1 Extended warranties shall be in accordance with General Condition GC 12.3, as amended by Section 00 73 00, and as follows:
  - .1 Where specifically identified in the *Contract Documents*, extended warranties shall be furnished by individual manufacturer for particular product/system/assembly or by *Subcontractor* for a particular product/system/assembly/section of the specifications.
  - .2 Extended warranties shall include for proper performance of the portion of the *Work* as defined by the scope of the applicable specification section to the extent that the design and *Contract Documents* permit such performance.
  - .3 Extended warranties shall be provided by *Subcontractor* unless warranty is specified to be provided by product manufacturer.
  - .4 The *Owner* shall promptly give the warrantor notice in writing of observed defects and deficiencies which occur during the warranty period.
  - .5 Extended warranties shall commence at date of *Substantial Performance of the Work*.
  - .6 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*.
  - .7 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 (date of *Substantial Performance of the Work*).
    - .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**

General Commissioning  
Requirements

---

**Part 1        General**

**1.1        SUMMARY**

- .1    Section Includes:
  - .1    General requirements relating to commissioning of project's components and systems, specifying general requirements to performance verification of components, equipment, sub-systems, systems, and integrated systems.
- .2    Related Sections:
  - .1    Section 01 91 31 – Commissioning Plan
  - .2    Section 01 91 41 – Commissioning Training Requirements
  - .3    Section 23 08 00 – Commissioning – Mechanical
  - .4    Section 26 08 00 – Commissioning – Electrical
- .3    Acronyms:
  - .1    Cx – Commissioning.
  - .2    CxA – Commissioning Agent (Stantec).
  - .3    EMCS – Energy Monitoring and Control Systems.
  - .4    O&M – Operation and Maintenance.
  - .5    IV – Installation Verification.
  - .6    PV – Performance Verification (Functional Testing).
  - .7    TAB – Testing, Adjusting and Balancing.

**1.2        GENERAL**

- .1    Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Cx Objectives:
  - .1    Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
  - .2    Ensure appropriate documentation is compiled into the O&M Manual.
  - .3    Effectively train O&M staff.
- .2    Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
  - .1    Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be operated interactively with each other as intended in accordance with Contract Documents and design criteria and intent.

General Commissioning  
Requirements

---

- .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

### 1.3 COMMISSIONING (Cx) OVERVIEW

- .1 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.
- .2 For Cx Training requirements refer to Section 01 91 41 – Commissioning Training.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 Cx ensures the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.
- .6 Engineer (Owner's Representative) will issue Interim Acceptance Certificate when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Engineer (Owner's Representative).
  - .2 Equipment, components and systems have been commissioned and all issues resolved.
  - .3 O&M training has been completed.

### 1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx; correct deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Engineer, to ensure effective performance.
- .2 Costs for corrective work, additional tests and inspections to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

### 1.5 PRE-CX REVIEW

- .1 Before Construction:
  - .1 Review contract documents, confirm by writing to Engineer.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.

General Commissioning  
Requirements

---

- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Have completed Cx Plan up-to-date.
  - .2 Have Cx schedule up-to-date.
  - .3 Ensure installation of related components, equipment, sub-systems, and systems are complete.
  - .4 Fully understand Cx requirements and procedures.
  - .5 Have Cx documentation shelf-ready.
  - .6 Understand completely; design criteria, intent and special features.
  - .7 Submit complete start-up documentation to Engineer and CxA.
  - .8 Have Cx schedules up-to-date.
  - .9 Ensure systems have been cleaned thoroughly.
  - .10 Complete TAB procedures on systems; submit TAB reports to Engineer and CxA for review and approval.
  - .11 Ensure "As-Built" system schematics are available.
- .4 Inform Engineer and CxA in writing of discrepancies and deficiencies on finished work.

## 1.6 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to Engineer and CxA before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

## 1.7 SUBMITTALS

- .1 Data for Commissioning.
  - .1 The Contractor will receive a request from the CxA requesting specific information needed about each piece of commissioned equipment or system.
  - .2 Typically, this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CxA.

General Commissioning  
Requirements

---

- .3 The CxA may request further documentation necessary for the commissioning process.
- .4 This data request may be made prior to or after normal submittals.
- .5 Much of this information is contained in the regular O&M manual submittals normally submitted in the project. Typically, this information is required prior to the regular formal O&M manual submittals.
- .2 Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Cx Agent's review.

**1.8 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 31 – Commissioning Plan for requirements and instructions for use.
- .2 CxA to review and evaluate Cx documentation.
- .3 Provide completed and evaluated Cx documentation to Engineer and CxA.

**1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule.
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of Cx reports.
  - .2 Verification of reported results.
  - .3 Repairs, retesting, re-commissioning, re-verification.
  - .4 Training.

**1.10 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings: 01 91 31 – Commissioning Plan and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At approximately the 60% construction completion stage. CxA to call a separate Cx kick-off meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
  - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
  - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

General Commissioning  
Requirements

---

- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and Functional Performance Testing period.
- .6 Meetings will be scheduled and chaired by Commissioning Agent, who will record and distribute minutes.
- .7 The General Contractors to ensure subcontractors and relevant manufacturer representatives are present at the kick-off meeting and subsequent Cx meetings and as required.
- .8 After each meeting, the CxA will perform a commissioning site review, update issues log and issue report to project manager.

**1.11 STARTING AND TESTING**

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

**1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days of notice prior to commencement.
- .2 Engineer and CxA may witness start-up and testing.

**1.13 MANUFACTURER'S INVOLVEMENT**

- .1 Factory testing – manufacturer to:
  - .1 Coordinate time and location of testing.
  - .2 Provide testing documentation for approval by CxA.
  - .3 Arrange for CxA to witness tests.
  - .4 Obtain written approval of test results and documentation from Engineer and CxA before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with CxA.
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review with manufacturer before start-up.
- .3 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
  - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:

General Commissioning  
Requirements

---

- .1 Experienced in design, installation and operation of equipment and systems.
- .2 Ability to interpret test results accurately.
- .3 To report results in clear, concise, logical manner.
- .4 Factory trained and authorized by the manufacturer to complete the intended work.

#### 1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up, testing and Cx in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of IV report forms.
    - .2 Visual inspection of quality of installation.
  - .2 Start-up: follow accepted start-up procedures.
  - .3 Operational testing: document equipment performance.
  - .4 System PV: include repetition of tests after correcting deficiencies.
- .3 Correct deficiencies and obtain approval from CxA after distinct phases have been completed and before commencing next phase.
- .4 Document required tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Engineer. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Engineer.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Engineer and/or CxA.
  - .3 If evaluation report concludes that major damage has occurred, Engineer or CxA shall reject equipment.
    - .1 Rejected equipment to be removed from site and replaced with new.
    - .2 Subject new equipment/systems to specified start-up procedures.

#### 1.15 START-UP DOCUMENTATION

- .1 General Contractors Site Cx Coordinator shall assemble start-up documentation and submit to CxA for approval before commencement of commissioning.
- .2 Start-up documentation to include:

General Commissioning  
Requirements

---

- .1 O&M Manuals (to Section 01 78 00 – Closeout Submittals, 01 91 31 – Commissioning Plan and details below)
- .2 Factory and on-site test certificates for specified equipment.
- .3 Pre-start-up inspection reports.
- .4 Signed installation/start-up Reports (IV forms).
- .5 Manufacturer start-up reports; and
- .6 Step-by-step description of complete start-up procedures, to permit CxA or O&M Staff to repeat start-up at any time.
- .7 Notification letter indicating completion of start-up procedures.

**1.16 OPERATION AND MAINTENANCE MANUALS**

- .1 The contractor shall compile O&M manuals for every piece of equipment and building operating or electrical system with the following format.
  - .1 Quantity: 4 Copies
  - .2 Format: 8 ½" x 11" loose leaf binders. Each binder shall be clearly labeled on the spine. Use as many as required. Do not overload binders. There shall be dividers with permanently marked tabs of card stock separating each section and sub section. Tab labels shall not be handwritten.
  - .3 There shall be a title page and table of contents in the front of each binder for contents. In each binder, there shall be a main tab for each specification section. Behind the section number tab there shall be the equipment ID tag and sub-tab for each piece of major equipment (or group, if small or numerous). These sub-tabs shall be similar to the specification number tabs but of a different color. Behind each equipment name tab shall be the following sections, in the given order, divided by a double weight colored sheet labeled with the title of the section.
    - .1 Contractor. The first page behind the equipment tab shall contain the name, address and telephone number of the manufacturer and installing contractor and the 24-hour number for emergency service for all equipment in this section, identified by equipment.
    - .2 Submittal and Product Data. This section shall include all approved submittal data, cut sheets and appropriate shop drawings. If submittal was not required for approval, descriptive product data shall be included.
    - .3 Operation and Maintenance Instructions. These shall be the written manufacturer's data with the model and features of this installation clearly marked and edited to omit reference to products or data not applicable to this installation. This section shall include but not limited to data on the following:
      - .1 Installation, startup and break-in instructions

General Commissioning  
Requirements

---

- .2 All starting, normal shutdown, emergency shutdown, manual operation, seasonal changeover and normal operating procedures and data, including any special limitations.
- .3 O&M and installation instructions that were shipped with the unit.
- .4 Preventative maintenance and service procedures and schedules.
- .5 Troubleshooting procedures.
- .6 Recommended schedule of maintenance requirements and frequency.
- .7 System single-line diagrams.
- .8 A parts list, edited to omit reference to items which do not apply to this installation.
- .9 A list of any special tools required to service or maintain the equipment.
- .10 Performance data, ratings and curves.
- .11 Operating instruction for integrated building systems.
- .12 Recommended schedule for calibrating sensors and actuators.
- .13 Warranty, which clearly lists conditions to be maintained to keep warranty in effect and conditions that would affect the validity of the warranty.
- .14 Any service contracts issued.
- .4 Supplemental Data. Prepare written text and/or special drawings to provide necessary information, where manufacturer's standard printed data is not available and information is necessary for a proper understanding and operation and maintenance of equipment or systems, or where it is necessary to provide additional information to supplement data included in the manual or project documents.
- .5 Control Drawings. Include the control drawings for the piece of equipment and its components, including the sequence of operation. This section will be provided by the controls contractor.
- .6 Test and Balance (TAB) Reports. Include TAB reports created for a particular system or piece of equipment and its components. This section will be provided by the TAB contractor.

**1.17 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

General Commissioning  
Requirements

---

- .2 With assistance of manufacturer, develop written maintenance program and submit to CxA and Owner for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

**1.18 TEST RESULTS**

- .1 If start-up, testing and/or PV produce unacceptable results; repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Contractor to provide manpower and materials; assume costs associated with revisits of Owner, Engineer and CxA for subsequent testing as required.

**1.19 START OF COMMISSIONING**

- .1 Notify Engineer, Owner and CxA at least 21 days prior to start of Cx.
- .2 Start Cx after elements of or issues with building affecting start-up and performance verification of systems have been resolved.

**1.20 INSTRUMENTS / EQUIPMENT**

- .1 Submit to CxA for review and approval:
  - .1 Complete list of instruments proposed to be used.
  - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
  - .1 2-way radios.
  - .2 Ladders.
  - .3 Equipment as required to complete work.

**1.21 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:
  - .1 Under actual or accepted simulated operating conditions, over entire operating range, in all modes.
  - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

General Commissioning  
Requirements

---

**1.22 WITNESSING COMMISSIONING**

- .1 CxA to witness Cx activities and verify results.

**1.23 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified, start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction; arrange for authority to witness procedures to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to CxA within five (5) days of testing. CxA will include copies in Final Cx Report

**1.24 COMMISSIONING CONSTRAINTS**

- .1 It is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

**1.25 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Engineer and CxA in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

**1.26 EXTENT OF VERIFICATION**

- .1 All energy consuming equipment and related systems including other systems identified by client:
  - .1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.
  - .2 Number and location to be at discretion of CxA.
  - .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
  - .4 Review and repeat commissioning of systems and equipment if inconsistencies found in more than 20% of reported results.
  - .5 Perform additional commissioning until results are acceptable to CxA.

**1.27 REPEAT VERIFICATIONS OR TESTS**

- .1 Assume costs incurred by Engineer, Owner's Representative and/or CxA for third and subsequent verifications where:

General Commissioning  
Requirements

---

- .1 Verification of reported results fail to receive Engineer, Owner's Representative or CxA approval.
- .2 Repetition of second verification again fails to receive approval.
- .3 Engineer, Owner's Representative or CxA deems Contractor's request for second verification was premature.

**1.28 SUNDRY CHECKS AND ADJUSTMENTS**

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

**1.29 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of CxA.
- .2 Report problems, faults or defects affecting Cx to CxA and Owner's Representative in writing. Stop Cx until problems are rectified.

**1.30 COMPLETION OF COMMISSIONING**

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Owner's Representative or CxA.

**1.31 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

**1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

**1.33 OCCUPANCY**

- .1 Cooperate fully with CxA during stages of acceptance and occupancy of facility.

**1.34 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and PV if:
  - .1 Accuracy complies with these specifications.
  - .2 Calibration certificates have been deposited with CxA.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

General Commissioning  
Requirements

---

**1.35 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Unless otherwise specified, to be within +/- 10% of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

**1.36 OWNER'S PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Engineer, Owner's Representative or CxA will not relieve Contractor from compliance with specified start-up and testing procedures.

**1.37 COMMISSIONING PROCESS ALLOCATION**

- .1 The commissioning process shall be allocated a value equal to 8% of the contract. This value shall be itemized in the Statement of Prices which forms the basis for progress payment for the various portions of work. The Contractors may draw from this allocation as the commissioning process is completed.
- .2 The Contractors shall submit all test and verification forms. The Engineer's Representative will use these forms to calculate a percentage complete.
- .3 The Contractor may claim up to 5% of the contract, as per Schedule of Breakdown, on a monthly basis, from this allocation leading up to performance testing. The remaining 3% shall not be paid out until the performance testing, O&M manuals and training have been completed satisfactorily.
- .4 The commissioning process allocation shall be broken down as follows:

Plumbing and drainage system testing	0.50%
Testing of piping systems	0.50%
Independent Contractor balancing of water systems	0.25%
Testing of air systems	0.50%
Independent Contractor balancing of air systems	0.25%
Testing of equipment and systems (system start-up)	0.50%
BAS commissioning	1.00%

General Commissioning  
Requirements

---

Commissioning Agent Performance Testing	2.00%
Operating and Maintenance Manuals	0.50%
Training	0.50%
Record Drawings	0.50%

**Part 2      Products**

**2.1      NOT USED**

.1      Not Used.

**Part 3      Execution**

**3.1      NOT USED**

.1      Not Used.

**END OF SECTION**

Commissioning Plan

---

**Part 1          General**

**1.1            GENERAL**

- .1      Appended is a Commissioning Plan (draft) describing requirements and processes pertaining to the commissioning of this project. The contractor shall cooperate in commissioning materials and equipment as described. The attached Commissioning plan is a living document and will be updating during the Commissioning procedure.

**Part 2          Products**

**2.1            NOT USED**

- .1      Not Used.

**Part 3          Execution**

**3.1            NOT USED**

- .1      Not Used.

**END OF SECTION**

**DRAFT COMMISSIONING  
PLAN: EAST HANTS AQUATIC  
CENTRE**



Prepared for:  
Municipality of East Hants  
Lloyd E. Matheson Centre  
15 Commerce Court  
Elmsdale, NS B2S 3K5

Prepared by:  
Stantec Consulting Ltd.  
102-40 Highfield Park Drive  
Dartmouth, NS B3A 0A3

Stantec File: 133431042

March 1, 2017

Revision Record							
Revision	Description	Prepared By		Checked By		Approved By	
0	DRAFT	DMG	3/21/2017	CSR	3/21/2017	CSR	3/21/2017
1	DRAFT	KAE	02/07/2018				

## Sign-off Sheet

This document entitled DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE was prepared by Stantec Consulting Ltd. ("Stantec") for the account of the Municipality of East Hants (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by \_\_\_\_\_  
(signature)

**Devon Guile, EIT**

Reviewed by \_\_\_\_\_  
(signature)

**Chris Russell, P.Eng., PMP, LEED AP BD+C**



## Table of Contents

<b>1.0</b>	<b>INTRODUCTION – BRIEF OVERVIEW OF THE COMMISSIONING PROCESS.....</b>	<b>1.1</b>
1.1	DEFINITIONS.....	1.2
<b>2.0</b>	<b>BUILDING INFORMATION .....</b>	<b>2.1</b>
<b>3.0</b>	<b>PROJECT TEAM .....</b>	<b>2</b>
3.1	COMMISSIONING TEAM'S RESPONSIBILITIES AND LIST OF COMMISSIONING PROCESS MILESTONES .....	3
3.2	LIST OF KEY COMMISSIONING MILESTONES .....	5
<b>4.0</b>	<b>DESCRIPTION OF THE MANAGEMENT, COMMUNICATION AND REPORTING OF THE COMMISSIONING PROCESS.....</b>	<b>6</b>
4.1	DESCRIPTION OF THE REPORTING OF THE COMMISSIONING PROCESS .....	6
<b>5.0</b>	<b>COMMISSIONING SCOPE OF WORK.....</b>	<b>8</b>
5.1	COMMISSIONED SYSTEMS .....	8
5.2	STANTEC COMMISSIONING SCOPE EXCLUSIONS.....	8
5.3	LIST OF COMMISSIONING AUTHORITY WORK PRODUCTS .....	8
<b>6.0</b>	<b>COMMISSIONING PROCESS.....</b>	<b>10</b>
6.1	INITIAL COMMISSIONING MEETING.....	10
6.2	FINAL COMMISSIONING PLAN.....	10
6.3	INSTALLATION VERIFICATION .....	10
6.4	FUNCTIONAL PERFORMANCE TESTING.....	11
6.5	DOCUMENTATION REQUIRED PRIOR TO FUNCTIONAL PERFORMANCE TESTING.....	11
6.6	TRAINING OVERSIGHT.....	12
6.7	PROGRESS REPORTS.....	12
6.8	FINAL REPORT .....	12

## LIST OF TABLES

Table 1	Project Team Information .....	2
Table 2	Team Responsibilities .....	4
Table 3	List of Key Commissioning Milestones .....	5
Table 4	Description of the Management, Communication and Reporting of the Commissioning Process.....	7
Table 5	List of Expected Work Products .....	9

**Appendix A – Pre-functional Documents – TBD**

**Appendix B – Functional Documents – TBD**

# 1.0 INTRODUCTION – BRIEF OVERVIEW OF THE COMMISSIONING PROCESS

Commissioning is a quality assurance process, conducted by a team independent of the design and construction teams, to improve the success of a construction project. It provides the owner with a means to independently verify the project's planning, design, construction, and operational process. The commissioning process seeks to provide optimized energy efficiency and indoor air quality.

This project specific commissioning process, during pre-construction phase, has the following steps:

- Become familiar with project documents and form the Commissioning Team
- Aid in the development of Owners Project Requirements and Basis of Design
- Develop a preliminary Commissioning Plan and a Commissioning Schedule
- Review Design Documents to verify Commissioned Systems meet Owners Project Requirements
- Define System Manual Requirements
- Define Training Requirements

During construction phase, the commissioning process has the following steps:

- Chair Commissioning meetings to ensure schedule integration
- Update Commissioning Plan for construction specific requirements
- Review operational checkout documents supplied by installing Contractors
- Perform site reviews of commissioned systems
- Develop Functional Testing Procedures (FPT) and Review

During commissioning phase, the commissioning process has the following steps:

- Verify equipment static checks
- Verify sampling of the Air and Hydronic System Balancing
- Verify OEM Equipment and System Start-ups
- Perform Functional Performance Tests (FPT)
- Track and Troubleshoot Issues and Deficiencies

During post construction phase, the commissioning process has the following steps:

- Oversee Training completion
- Perform Operations & Maintenance (O&M) Manual Commissioning Review
- Final Deficiency Resolution, verification and Sign Off
- Evaluate Systems Manual and Supporting Documentation



## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Introduction – Brief Overview of the Commissioning Process  
March 1, 2017

- Develop the Final Commissioning Plan
- Perform Seasonal or Deferred Testing
- Track and Troubleshoot Seasonal Testing Issues
- Final Seasonal Issue Resolution and Sign Off
- Final System Acceptance
- Develop the Final Commissioning Report
- Perform Post Occupancy Warranty Interviews & Site Reviews

### 1.1 DEFINITIONS

In order to understand the Commissioning Plan, the following terms have been defined. Any reference to these terms carries the stated and associated working definition outlined herein.

**Independent Commissioning Agent (ICA)** - Is the service firm and its resources (internal and external) that provide the planning, preparation, implementation and management of the detailed commissioning plan. The Independent Commissioning Agent (ICA) will be responsible for coordinating the activities of the commissioning team members.

**Commissioning Agents** - The internal technical resource staff of the ICA that will be responsible for the execution of the on-site testing activities.

**Commissioning Team** - Personnel that will be directly involved in the building commissioning process. The commissioning team consists of the owner's representatives, ICA, Contractors, Manufacturer's Reps, Consultants and O&M Staff.

**Commissioning Plan** - The Commissioning Plan defines the scope and approach to the Total Building commissioning program that is to be executed for the project (i.e. this document)

**Contractors** - These are the Prime Contractor and their Subcontractors who are responsible for physical construction of the project.

**Project Manager** - The individual or firm responsible for the overall management and delivery of the project to the Owner.

**Consultants** - The architects and engineers responsible for producing the design drawings and specifications for this project as well as the base contract administration inspection, quality assurance and acceptance activities.

**User / Operator** - A user or operator is an individual or group that will work in and operate various aspects of the facility once the project has been turned over.

**In Contract Tests** - Testing requirements that are defined in the contract documents that are a contractor's responsibility to carry out and document appropriately.



## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Introduction – Brief Overview of the Commissioning Process  
March 1, 2017

**Commissioning Check Sheets** - Mechanical, Electrical, Controls equipment and Architectural systems check sheets that are specific to each system and its major components. These are used to verify system operation and are developed by the ICA with the support of the commissioning team and OEM suppliers.

**Static Inspections** - Systematic detailed inspections of operable architectural, mechanical, electrical systems and components carried out under the commissioning plan by personnel from the construction team. Site personnel will utilize manufacturer's check sheets for recording installation deficiencies on a component / system basis. Timing of static inspections is tied to construction progress and occurs once the contractor's construction installation process and construction checks have been completed for the individual equipment components or systems.

**Contractor Start-Up Program** - Contractor start-up and verification program activities are conducted by the contractors and/or their sub-trades and equipment vendors. Contractor/ Vendor checking of the physical installation of the work and equipment and reviewing the completion of system installation and readiness, is completed prior to the Commissioning Agents functional performance testing and verification activities.

**Functional Performance Testing (FPT)** - Functional performance tests are specific hands-on tests, used to verify that the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility and the Design Intent.

**Training Manual** – The training manual is a document that identifies all training requirements and contains all training forms that are used to track the completion of the Training Program (By Contractors).

## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Building Information  
March 1, 2017

### 2.0 BUILDING INFORMATION

Project Name: East Hants Aquatic Centre  
Location: Elmsdale, NS  
Building Type: Aquatic Facility  
Building Area: 2,555 m<sup>2</sup>



## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Project Team  
March 1, 2017

### 3.0 PROJECT TEAM

**Table 1 Project Team Information**

Title	Name/Company	Contact information
Project Manager	Roger H. Plant, P.Eng. Project Manager  RHP Project Management Services Inc.	PO Box 235 Dartmouth, NS B3Y 3Y3 Ph: (902) 465-2137 C: (902) 410-2137 rplant@rhppm.com
Project Leader	Kate Friars Director of Parks, Recreation and Culture  Municipality of East Hants	230-15 Commerce Court Elmsdale, NS B2S 3K5 Ph: (902) 883-7098 x 143 C: (902) 751-2731 kfriars@easthants.ca
Commissioning Agents	Chris Russell, P.Eng., PMP, LEED AP BD+C Project Coordinator/Lead Commissioning Agent  Benjamin Ellah, P.Tech. Pool Systems Specialist  Marc Roy Electrical Commissioning Specialist  Keith Estey, P.Eng. Commissioning Agent  Devon Guile, EIT Commissioning Agent  Stantec Consulting Ltd.	102 – 40 Highfield Park Drive Dartmouth, NS B3A 0A3 Ph: (902) 468-7777 C: (902) 430-5307 Chris.Russell@stantec.com  200-325 25th Street SE Calgary, AB T2A 7H8 Ph: (403) 806-1559 C: (403) 991-5197 Benjamin.Ellah@stantec.com  10160-112 Street Edmonton, AB T5K 2L6 Ph: (780) 917-1870 Marc.Roy@stantec.com  102 – 40 Highfield Park Drive Dartmouth, NS B3A 0A3 Ph: (902) 468-7777 C: (902) 225-7219 Keith.Estey@stantec.com  102 – 40 Highfield Park Drive Dartmouth, NS B3A 0A3 Ph: (902) 468-7777 Devon.Guile@stantec.com
Prime Consultant	J. David Miller, ARCHITECT AIBC OAA SAA MRAIC  MacLennan Jaunkalns Miller Architects	425 Adelaide Street West Level 6 Toronto, ON M5V 3C1 Ph: (416) 593-6796 dmiller@mjmarchitects.com



## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Project Team  
March 1, 2017

Title	Name/Company	Contact information
Mechanical/Electrical Designers	Troy Droesbeck, P.Eng. Mechanical Engineer  Tyler Hughes, P.Eng. Electrical Engineer  Smith & Andersen	1969 Upper Water Street, Suite 1905 Halifax, NS B3J 3R7 Ph: (902) 440-0981 troy.droesbeck@smithandandersen.com  Ph: (902) 440-0981 tyler.hughes@smithandandersen.com
General Contractor	Require Name  Require Contractor's Firm	Require Contact Info
Mechanical Contractor	Require Name  Require Contractor's Firm	Require Contact Info
Electrical Contractor	Require Name  Require Contractor's Firm	Require Contact Info
Controls Contractor	Require Name  Require Contractor's Firm	Require Contact Info
Balancing Contractor	Require Name  Require Contractor's Firm	Require Contact Info

### 3.1 COMMISSIONING TEAM'S RESPONSIBILITIES AND LIST OF COMMISSIONING PROCESS MILESTONES

Table 2 gives a task breakdown of the Commissioning Process and lists the responsible parties. The completion of each of the following commissioning tasks is considered a Commissioning Process Milestone.



## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Project Team  
March 1, 2017

**Table 2 Team Responsibilities**

	Design Team Lead	Project Manager	Commissioning Authority	Mechanical Designer	Electrical Designer	Contractor	Owner/Operator
Plan and schedule design meetings	x	x					
Plan and schedule construction meetings	x	x				x	
Plan and schedule site inspections and operation tests		x	x			x	
Develop Cx plan and edit as necessary			x				
Review and comment on Cx plan	x	x	x	x	x	x	x
Review Owners Project Requirements			x				
Develop Building Basis of Design			x				
Review and comment on Design development report, ensure OPR and BOD are met	x	x	x	x	x		x
Prepare Specification	x		x	x	x		
Review and comment 33%, 66% submissions, ensure OPR is met			x	x	x		
Review Submittals	x		x	x	x		
Develop installation checklists			x				
Complete installation checklists						x	
Develop functional test and checklists			x				
Perform functional test and complete checklists	x	x	x			x	x
Organize O&M manual		x		x	x	x	
Review and approve O&M manual			x	x	x		
Determine requirements of operator training			x				x
Conduct operator training			x				
Develop Systems Manual			x	x		x	
Perform Seasonal/Deferred Testing	x	x	x			x	x
Complete Final Commissioning Report			x				
Perform Post Occupancy Warranty Interviews & Site Reviews			x				



## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Project Team  
March 1, 2017

### 3.2 LIST OF KEY COMMISSIONING MILESTONES

Table 3 gives a date of the completion of each of the following commissioning milestones.

**Table 3 List of Key Commissioning Milestones**

Milestone	Date Completed
Owner's Project Requirements Developed	TBD
Basis of Design Requirements Developed	TBD
33% Design Documents reviewed to ensure design intent is met	TBD
66% Design Documents reviewed to ensure design intent is met	TBD
Draft Commissioning Plan developed	TBD
Cx plan reviewed and comments incorporated	TBD
Shop drawings reviewed to ensure design intent is met	TBD
Installation checklists developed	TBD
Completion of installation checklists (by Contractors)	TBD
Functional tests and checklists developed	TBD
Functional tests performed and checklists completed	TBD
Organization of the O&M manual	TBD
O&M manual reviewed and approved	TBD
Determine requirements of operator training	TBD
Operators system level training conducted	TBD
Systems manual developed	TBD
Seasonal/Deferred Testing performed	TBD
Completion of final commissioning report	TBD
Post Occupancy Warranty Interviews & Site Reviews	TBD

## **4.0 DESCRIPTION OF THE MANAGEMENT, COMMUNICATION AND REPORTING OF THE COMMISSIONING PROCESS**

The Commissioning Team shall follow the following communication protocol in the event that issues arise. Table 4 is an identification tool for proper management, communication and reporting to be used by the Commissioning Team. The Project Team shall look over the following to insure their responsibility in the event of an issue is understood.

All communication and management throughout the commissioning process is structured as follows. If there is a request for information or a formal document requested, the ICA first approaches the Owner's Project Manager for resolution. If the ICA requires verbal information for clarification, they are to go directly to the informed party. If the ICA needs to notify contractors of deficiencies, they are to document deficiencies through the Project Manager. When the ICA requires Functional Testing to be scheduled, they can supply some input but do not do any scheduling. The ICA does not have the authority to issue any change orders. Should Subcontractors disagree with the requests or interpretations by the ICA, the Subcontractor should try to resolve the issue with the ICA and notify the Project Manager. For further reference see Table 4.

### **4.1 DESCRIPTION OF THE REPORTING OF THE COMMISSIONING PROCESS**

All reporting from the ICA is sent to the Project Manager. The Project Manager is then responsible for officially distributing appropriate contents to other parties and subcontractors. For further reference see Table 4.

## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Description of the Management, Communication and Reporting of the Commissioning Process  
March 1, 2017

**Table 4 Description of the Management, Communication and Reporting of the Commissioning Process**

Issue	Protocol
For requests for information (RFI) or formal documentation requests	Stantec, acting as the Independent Commissioning Agent (ICA) goes first to the East Hants Project Manager. (Copy to Contractor).
For verbal information or clarification	The ICA goes directly to the informed party.
For notifying contractors of deficiencies	The ICA documents deficiencies through the East Hants Project Manager. (Copy to Contractor).
For scheduling monthly commissioning meetings	The ICA shall suggest the times for monthly commissioning meetings to the Contractor. Contractor shall schedule.
For scheduling systems tests or training	The ICA shall suggest the times for functional testing and training to the contractor. Contractor shall schedule all required parties.
For making requests for significant changes	The ICA has no ability to issue change orders, this is the responsibility of the East Hants Project Manager and Design Team. ICA may suggest change to East Hants Project Manager and Designers.
Contractor disagreement with requests or interpretations by the ICA	The ICA shall try to resolve with the Contractor, but the Owner's Project Manager shall be informed of all issues.
ICA reporting of all commissioning issues	The ICA shall track all commissioning issues using ICAIlog's built in Issues Log. All issues will be assigned to individual parties and followed up on weekly. The East Hants Project Manager will be aware of all commissioning issues and their resolution.

## **5.0 COMMISSIONING SCOPE OF WORK**

### **5.1 COMMISSIONED SYSTEMS**

The following systems will be commissioned per ASHREA 202-2013:

#### **Mechanical Systems:**

- Plumbing Systems
- Heating Systems
- Ventilation Systems
- Air Conditioning Systems
- Refrigeration Systems
- Fire Protection Systems
- Pool Systems

#### **Electrical Systems:**

- Incoming Electrical Service
- Electrical Main Distribution
- Power Distribution System
- Grounding System
- Emergency and Exit Lighting
- Lighting and Lighting Controls
- Control System
- Information technology and communication systems

### **5.2 STANTEC COMMISSIONING SCOPE EXCLUSIONS**

The following Systems are not included in this commissioning scope. This does not relieve the Contractor of their commissioning duties for these systems.

- Architectural or Building Envelope Systems
- Vertical and Horizontal Transportation Systems

### **5.3 LIST OF COMMISSIONING AUTHORITY WORK PRODUCTS**

The following items listed in Table 5 are to be delivered by the ICA to the Project Manager and to Prime Contractor.



## DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE

Commissioning Scope of Work  
March 1, 2017

**Table 5 List of Expected Work Products**

List of Expected Work Products
Draft Owner's Project Requirements (Revised as necessary)
Draft Commissioning Plan (Revised as necessary)
Owner's Project Requirements Review Report
Design Commissioning Meeting Minutes
Basis of Design Review Report
33% Cx Design Review Report
66% Cx Design Review Report
Commissioning Specification Sections 01 19 13, 01 91 31, 01 91 41, 23 08 00, and 26 08 00
Updated Issues Log from Review Reports
Detailed Systems Manual Requirement Letter
Detailed Training Requirements Letter and Full Set of Training Forms
Updated Commissioning Plan including Design Specific Requirements
Kick-off Commissioning Meeting Minutes and Updated Commissioning Schedule
Updated Commissioning Plan including Construction Specific Requirements
Contractor Submittal Review Report and Updated Issues Log
Commissioning Meeting Minutes and Commissioning Site Review Reports
Mechanical and Electrical Building Systems Construction (Start-up) Checklists
Mechanical and Electrical Building Systems Functional Performance Test Procedure Forms
Testing and Balancing Verification Report and Updated Issues Log
Correspondence Verifying Each System Installation and Updated Issues Log
OEM Start-up Witnessing Reports and Updated Issues Log
Functional Performance Testing Report along with Daily Email updates during Testing
Regularly Updated Commissioning Issues Log
Full Set of Signed Off Training Forms
O&M Manual Evaluation Report
Letter and Certificate Indicating Sign off of all Functional Performance Test Items
Systems Manual Evaluation Report
Letter Summarizing Training Including Training Program Sign-Off
Finalized Commissioning Plan and Commissioning Report (illustrating outstanding items)
Seasonal/Deferred Testing Report and Updated Issues Log
Regularly Updated Commissioning Issues Log
Final Signed Off Commissioning Issues Log
Finalized Commissioning Report (no outstanding issues remaining)
Letter and Certificate of indicating System Acceptance and Commissioning Completion
Lessons Learned Agenda and Meeting Minutes
Post Occupancy Warranty Report



## **6.0 COMMISSIONING PROCESS**

The commissioning process is described herein.

### **6.1 INITIAL COMMISSIONING MEETING**

A commissioning meeting shall be called, chaired and minuted by the ICA roughly two months from the before commencing Functional Performance Testing. In attendance shall be the Project Manager, Architect, Mechanical and Electrical Designers, Prime contractor representative and all other designated subcontractors.

The meeting will review the reporting structure, lines of communication, the different parties' responsibilities, and the general schedule for startup of equipment, Consultant's site inspections and Functional Performance Testing.

The desired outcome of the meeting is a good understanding by all involved parties of the commissioning process and their individual responsibilities.

### **6.2 FINAL COMMISSIONING PLAN**

The Commissioning Plan will be developed throughout the Design Phase, then will remain unchanged until the kick-off commissioning meeting. Following the initial commissioning meeting, the ICA will invite comments on the commissioning plan. They will also update the plan to include a high level commissioning schedule that was discussed during the meeting. The commissioning plan is then approved by the Project Manager and all commissioning tasks are implemented into the Project Construction Schedule. The Commissioning Plan is a live document and can be updated throughout the Cx procedure. Each time the Cx Plan is updated it must be submitted for Project Manager Approval and then distributed among the Cx Team members.

### **6.3 INSTALLATION VERIFICATION**

Prior to the startup of the equipment, all equipment shall be inspected and correct installation verified by the Contractor. This is done to reduce delays and damage to the equipment during startup and Functional Performance Testing.

Every piece of equipment is inspected and then started-up by the Installing Contractor. There is to be no sampling at this step. The ICA is not present during each test.

All deficiencies noted during installation inspection and start-up procedures are to be recorded and resolved by the contractor before Functional Performance Testing will commence. The ICA

has the right to review a sample of equipment of his/her choosing during the Functional Performance Testing Phase.

## **6.4 FUNCTIONAL PERFORMANCE TESTING**

The Functional Test is not only the testing of each piece of equipment, but is also a check that the pieces of equipment together produce the intended final result.

It is the responsibility of the Prime Contractor to schedule the functional tests with the subcontractors, the Project Manager, and the ICA.

It is the responsibility of the ICA to document all results of the functional tests in a Functional Performance Testing issues log. Any deficiencies are to be corrected by the subcontractor and verification of issue resolution will be confirmed by the Project Manager. Any disputes regarding the requirement of retesting shall be managed by the Project Manager with Design Team assistance.

## **6.5 DOCUMENTATION REQUIRED PRIOR TO FUNCTIONAL PERFORMANCE TESTING**

In conjunction with Contractual Requirements, Stantec (ICA) is to verify the functionality of the Building's Mechanical, Electrical and Architectural (See 5.1). In order to facilitate this verification process, Stantec needs to be provided with the following contractor developed documentation prior to beginning our on-site Functional Performance Testing Procedure:

- Written statements that all Systems are fully operational, inspected and Deficiencies corrected
- Record Drawings and Maintenance Manuals including Shop Drawings
- All Manufacturer Supplied Start-up Verification Reports (to supplement the forms provided by Stantec)
- Stantec supplied Pre-Functional Testing Forms (fully filled and approved by Stantec)
- All Fire Alarm, Fire Suppression and Life Safety System Verification Reports from Contractor and Local Jurisdiction
- Completed Controls Point Verification Report and Controls Graphic Screenshots
- Final Sequence of Operations for Systems.
- All Piping Pressure Test Reports (Internal and Site)
- All Ducting Pressure Test Reports
- Air and Hydronic Flush-out Reports
- Air and Hydronic Balancing Reports
- Minimum Fresh Air Volumes for each Air Handling System
- Static Air and Water Pressure Set Points for Variable Speed Fans and Pumps Respectively
- Chemical Treatment Reports (where required)
- All Network/Signal Strength Testing Reports and Certificates (Voice and Data)
- Security System Reports and Certificates
- Emergency Power Test Reports



## **DRAFT COMMISSIONING PLAN: EAST HANTS AQUATIC CENTRE**

Commissioning Process  
March 1, 2017

- Electrical Panel inventory including circuitry for each Panel Board
- Confirmation that all cleaning has been done and that Filters have been replaced and Strainers cleaned
- Training Plan developed by Contractor

### **6.6 TRAINING OVERSIGHT**

The ICA and owner will determine Mechanical/Electrical/Architectural training Requirements. The ICA will compile these requirements into customized "system based" training forms. These forms will be filled by contractors and trained personnel during training. The completed forms will form the final Training Plan and will be included in the final Commissioning Report.

### **6.7 PROGRESS REPORTS**

The ICA shall supply the Project Manager with monthly financial progress reports through the design team lead. There will also be regular communication between the ICA and the Project Manager to discuss Commissioning Issues as they arise, develop, and are ultimately resolved.

### **6.8 FINAL REPORT**

The ICA will supply the Project Manager with a final commissioning report.

The Final Commissioning Report ultimately serves as a record of all commissioning activities for the project and will include the following:

- Verification that the commissioned equipment was installed correctly
- Verification that the commissioned equipment was started up correctly
- Verification that the commissioned equipment and systems are functioning as per the Design Operational Intent
- Functional Performance Testing Issues Log
- Completed Training Plan

## **Appendix A – Pre-functional Documents – TBD**

## **Appendix B – Functional Testing Documents – TBD**

Commissioning Training

---

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 This Section specifies roles and responsibilities of Commissioning Training.
- .2 Related Requirements
  - .1 Section 01 91 13 – General Commissioning
  - .2 Section 01 91 31 – Commissioning Plan
  - .3 Specific training requirements identified in specification sections applicable to all commissioned equipment and systems

**1.2 TRAINEES**

- .1 Trainees: personnel selected for operating and maintaining this facility. This includes building operators, maintenance staff, security staff, key staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for the purpose of familiarization with the building's systems.

**1.3 INSTRUCTORS**

- .1 Design Team will provide:
  - .1 Descriptions of systems.
  - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and as required certified factory-trained manufacturers' personnel are to provide instruction on the following:
  - .1 Start-Up, operation, shut-down of equipment, components, and systems.
  - .2 Control features, reasons for, implications on associated systems of, adjustment of set points of control, and safety devices.
  - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
  - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

**1.4 TRAINING OBJECTIVES**

- .1 Training to be detailed and shall allow enough time to ensure:
  - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
  - .2 Effective on-going inspection, measurements of system performance.
  - .3 Proper preventive maintenance, diagnosis and trouble-shooting.

Commissioning Training

---

- .4 Ability to update documentation.
- .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.
- .2 TRAINING MATERIALS
  - .1 Instructors to be responsible for content and quality.
  - .2 Training materials to include:
    - .1 "As-Built" Contract Documents.
    - .2 Operating Manual.
    - .3 Maintenance Manual.
    - .4 TAB and PV Reports.
  - .3 Training materials shall be provided in an electronic format that permits future training procedures to the same degree of detail.
  - .4 Supplemental training materials may include:
    - .1 Multimedia presentations.
    - .2 Manufacturer's training videos.
    - .3 Equipment models.
  - .5 Scheduling
    - .1 Contractor will develop a detailed training schedule.
    - .2 Deliver system level training for commissioned equipment during regular working hours. Training sessions to be a maximum of 3 (three) hours in length.
    - .3 Training to be completed prior to acceptance of facility.
  - .6 Responsibilities
    - .1 Contractor to be responsible for:
      - .1 Implementation of training activities,
      - .2 Coordination among instructors,
  - .7 Training Content
    - .1 Training to include demonstrations by Instructors using the installed equipment and systems.
    - .2 Content includes:
      - .1 Review of facility and occupancy profile.
      - .2 Functional requirements.
      - .3 System philosophy, limitations of systems and emergency procedures.
      - .4 Review of system layout, equipment, components and controls.
      - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
      - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves,

---

Commissioning Training

---

- dampers, switches, adjustment of control settings and emergency procedures.
- .7 Maintenance and servicing.
- .8 Trouble-shooting diagnosis.
- .9 Interaction among systems during integrated operation.
- .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.
- .8 Provide necessary personnel to facilitate full systems demonstrations during a refresher session 1-6 months after original training sessions and prior to the end of the warranty period.

**Part 2        Products**

**2.1        NOT USED**

- .1 Not Used.

**Part 3        Execution**

**3.1        NOT USED**

- .1 Not Used.

**END OF SECTION**

Concrete Formwork and Falsework

---

Read and be governed by conditions of the *Contract* and sections of Division 1.

## **PART 1 – GENERAL**

### **1.1 Work Included**

- .1 This section of the Specifications complements the drawings in describing services, labour and materials necessary to complete supply, fabrication and erection of concrete formwork necessary to complete the Work summarized as but not necessarily limited to:
  - .1 Footings and foundation walls
  - .2 Piers and pilasters
  - .3 Walls and columns
  - .4 Suspended slabs and slabs on steel deck.
  - .5 Slabs on grade
  - .6 Duct banks
  - .7 Equipment bases
  - .8 Miscellaneous formwork

### **1.2 Related Work**

- |                            |                  |
|----------------------------|------------------|
| .1 Concrete Reinforcement  | Section 03 20 00 |
| .2 Cast-in-Place Concrete  | Section 03 30 00 |
| .3 Concrete Floor Finishes | Section 03 35 00 |

### **1.3 Reference Standards**

- .1 Do concrete formwork in accordance with CSA-A23.1-09, except where specified otherwise.
- .2 Do falsework in accordance with CSA S269.1-1975, except where specified otherwise.

## **PART 2 – PRODUCTS**

### **2.1 Materials**

- .1 Formwork lumber: plywood and wood formwork materials to CSA-A23.1-14, CSA-086.1, CSA-0121-08, and CSA-0153-13.
- .2 Falsework materials: to CSA S269.1-1975.
- .3 Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms. Release agent to be non-toxic, biodegradable and have zero or low VOC's. Petroleum based form release agents are not permitted on the project.
- .4 Tubular column forms: round, spirally wound laminated fiber forms, internally treated with release material.

Concrete Formwork and Falsework

---

- .5 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .6 Form ties at pool tanks and surge tanks: screw coil metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface, free of any metal parts or components left at the face of the formed surfaces.

## **PART 3 – EXECUTION**

### **3.1 Erection**

- .1 Verify lines, levels and column centres before proceeding with formwork and ensure dimensions agree with drawings.
- .2 Construct forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1-14.
- .3 Construct falsework in accordance with CSA S269.1-1975.
- .4 Obtain Consultant's permission before framing openings not indicated in concrete joists, beams or columns.
- .5 Obtain Consultant's approval for use of earth forms.
- .6 Hand-trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .7 Align form joints and make watertight. Keep form joints to minimum.
- .8 Locate horizontal form joints for exposed columns 2.4 m above finished floor elevation.
- .9 Use 25 mm chamfer strips on external exposed corners of beams, joints and columns.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Clean formwork in accordance with CSA-A23.1-14 before placing concrete.
- .12 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 3 days for columns.
  - .2 28 days for beam soffits, slabs, decks and other structural members, or 7 days when replaced immediately with adequate shoring to standard specified for falsework.
  - .3 3 days for walls, piers, footings and abutments.
- .13 Re-use of formwork and falsework subject to requirements of CSA-A23.1-14.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Integral crystalline waterproofing of concrete including:
    - .1 Pool tank and surge tank waterproofing.

### **1.2 Administrative Requirements**

- .1 Conduct a pre-installation meeting in accordance with Section 13 11 14.
  - .1 Independent inspection and testing company shall attend the pre-installation meeting.
- .2 Review waterproofing requirements including, but not limited to, the following:
  - .1 Verify that final waterproofing, penetration, and waterstop details comply with waterproofing manufacturer's current installation requirements and recommendations, and with design and performance requirements specified.
- .3 Sequencing and scheduling: Trial mixes conducted prior to the project start shall have determined workability and setting times and strength development. This data shall be used to plan appropriate schedules for placing, finishing and removal of formwork.

### **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 technical data sheets, manufacturer's best practise guide, and application instructions including instructions relating to waterstop joints and penetration details.

### **1.4 Quality Assurance**

- .1 Qualifications: Execute the work of this section only by a *Subcontractor* 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.

### **1.5 Delivery, Storage, and Handling**

- .1 Delivery: Deliver materials in manufacturer's original, unopened packages bearing the complete product label and lot number.
- .2 Storage: Store materials in a warm and dry location. Protect from humidity or moisture contamination.

### **1.6 Field Conditions**

- .1 Weather conditions: in accordance with CSA-A23.1-09.

Integral Crystalline Waterproofing – Hydrostatic Conditions

---

## **1.7 Extended Warranty**

- .1 Warrant work of this section in accordance with Section 01 78 36 for a period of 2 years. In addition provide:
  - .1 25-year manufacturer's limited standard material warranty for the waterproofing admixture.
  - .2 10-year manufacturer's limited labour and material performance warranty for the waterproofing admixture system.

## **PART 2 - PRODUCTS**

### **2.1 Performance/Design Requirements**

- .1 System Description:
  - .1 Crystalline integral concrete waterproofing admixture system: The admixture shall be a Permeability Reducing Admixture for Hydrostatic Conditions (PRAH) as indicated by ACI 212.3R-10 (Chapter 15). The admixture will initiate and promote the growth of long, narrow crystal structures sufficient to fill and block capillary pores and microcracks within the concrete in order to prevent the passage of water. The admixture must remain available within the hardened concrete and must react to future presence of water to self-seal minor cracking that may occur in the future.
  - .2 Additional system requirements include construction joint details, penetration details, waterstops and remedial waterproofing steps.
- .2 System Performance Requirements
  - .1 Waterproofing system and remedial waterproofing materials shall provide watertight protection to prevent the passage of water when subjected to hydrostatic pressure. The passage of liquid water shall constitute a failure.
  - .2 Permeability: The coefficient of permeability for admixture treated concrete will be reduced by a minimum of 70% compared to untreated concrete when tested using BS EN 12390-8 at 150 psi of pressure for 96 hours (Taywood- Valenta Method, ACI 212.3R-10).
  - .3 Permeability: No passage of water through treated samples when exposed to a vertical water head equal to 140 meters (460 feet).
  - .4 Compressive strength: Treated concrete must have compressive strength equal or higher than plain concrete when tested in accordance with ASTM C39/C39M-16b at 28 days and at one year.
  - .5 Drying shrinkage: Minimum 20% reduced drying shrinkage for treated concrete compared to untreated concrete when tested according to ASTM C157/C157M-08e1 or equivalent.
  - .6 Self-sealing: Autogenous crack sealing of treated concrete for cracks with width of up to 0.4 mm (0.02"); verified by independent testing.
  - .7 Chemical resistance: Minimum 20% less weight loss compared to untreated specimen after exposure to 5% sulfuric acid for 70 days.

Integral Crystalline Waterproofing – Hydrostatic Conditions

---

- .8 Carbonation resistance: No increase in rate of carbonation compared to untreated concrete when exposed to a 4% carbon dioxide atmosphere for 28 days.
- .9 Chemical Resistance: In accordance with ASTM C267-01(2012) and shall exhibit no detrimental effects after exposure.

## 2.2 Materials

- .1 General:
  - .1 Install only *Products* as supplied by one manufacturer/*Supplier* for work of this section.
- .2 Acceptable manufacturers:
  - .1 Aquafin Inc.
  - .2 Kryton International Inc.
  - .3 Substitutions: in accordance with Section 01 25 00.
- .3 Acceptable *Products*:
  - .1 Waterproofing admixture: formulation as required to suit concrete mix in accordance with manufacturer's installation instructions.
    - .1 Acceptable *Products*:
      - .1 Aquafin Inc. 'Aquafin-IC Admix'.
      - .2 Kryton 'Krystol Internal Membrane (KIM)'.
  - .2 Waterstop grout system:
    - .1 Waterstop grout:
      - .1 Basis of design: Kryton Krystol Waterstop Grout.
    - .1 Waterstop joint treatment:
      - .1 Basis of design: Kryton Krystol Waterstop Treatment.

## 2.3 Dosage

- .1 Dosage of the waterproofing admixture shall be in accordance with manufacturer's recommendations.

## PART 3 - EXECUTION

### 3.1 Concrete Batching and Mixing

- .1 Comply with manufacturer's batching and mixing instructions; the following paragraphs are for general guidance purposes only:
  - .1 Waterproofing admixture shall be added to the concrete at the time of batching at a concrete plant that is acceptable to the manufacturer. Dosage shall be properly supervised and a record kept of quantities and lot numbers.
  - .2 Concrete shall be batched following the approved mix design as determined through prior trials. Content of cementing materials shall not be less than 300 kg m<sup>3</sup> (500 lb./cu. yd). Water content shall be kept to within the specified water to cementing material ratio and this ratio shall not exceed 0.45.

---

Integral Crystalline Waterproofing – Hydrostatic Conditions

---

- .3 Waterproofing admixture shall be added to the dry ingredients prior to batching and if this is not possible, waterproofing admixture should be added prior to the addition of other admixtures. Do not mix waterproofing admixture with other admixtures prior to addition. Add waterproofing admixture separately from other admixtures.
- .4 Allow waterproofing admixture to thoroughly mix at medium/high speed for 1 minute per cubic meter/yard in the batch and a minimum of 3 minutes. Place and finish in accordance with CSA-A23.1-09. If possible, hold back a portion of super plasticizer during the initial batching and add the held portion at the jobsite immediately before discharging.

### **3.2 Concrete Placing**

- .1 Place concrete promptly. waterproofing admixture treated concrete will be expected to perform as a waterproof membrane. Therefore, superior consolidation is required. Follow CSA-A23.1-09 for properly consolidating concrete with special attention given to joint locations.

### **3.3 Curing**

- .1 Curing is essential to reduce or eliminate shrinkage cracking: Wet cure concrete in accordance with CSA-A23.1-09. If wet curing is not possible, apply a curing compound that meets ASTM C309-11.

### **3.4 Construction Joints, Penetrations, and Tie-Holes**

- .1 Construction joints and control joints must be designed and spaced to isolate and control shrinkage cracking in accordance with CSA-A23.1-09. The locations of joints must be indicated on the project drawings and be acceptable to the *Consultant*.
- .2 Waterstop system shall be installed in non-moving construction joints and shrinkage control joints according to manufacturer's application instructions.
- .3 Treat pipe penetrations in accordance with manufacturer's application instructions.
- .4 After completion of concrete placement, treat tie-holes in accordance with manufacturer's application instructions.

### **3.5 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00. Inspection and testing shall include the following in accordance with manufacturer's installation instructions:
  - .1 Slump: CAN/CSA A23.2-09.
  - .2 Air content: CAN/CSA A23.2-09.
  - .3 Temperature of concrete and of ambient air.
  - .4 Time of batching, testing and placement.
  - .5 Cylinders: Take compressive test cylinders from each load tested or as called for in Section 03 30 00.
- .2 Concrete supplier shall conduct laboratory and field trials as necessary to successfully incorporate the waterproofing admixture into their concrete mixture. Follow the manufacturer's testing guidelines.

Integral Crystalline Waterproofing – Hydrostatic Conditions

---

- .3 Examination for defects: Do not conceal waterproofing admixture treated concrete before it has been observed by a manufacturer's representative and inspection and testing company representative. Concrete shall be examined for structural defects such as faulty construction joints, cold joints and cracks. Such defects to be repaired in accordance with manufacturer's repair procedures.
- .4 Observance of leaks: Leaks that occur through well consolidated concrete or tight cracks shall self-seal within short period of time in accordance with manufacturer's data. Leaks that occur through poorly consolidated concrete or large cracks must be repaired in accordance with the manufacturer's repair instructions.
- .5 Field quality control of this section shall include participation in field quality control specified under Section 13 11 13. Acceptance of the work of this section shall be contingent upon successful completion of testing for watertightness specified in Section 13 11 13.
  - .1 Patching and filling of pool tank to achieve watertightness shall not be permitted or accepted.
- .6 Manufacturer's field review to be in accordance with Section 01 45 00.

**END OF SECTION**

---

Read and be governed by conditions of the *Contract* and sections of Division 1.

## **PART 1 – GENERAL**

### **1.1 Work Included**

- .1 This section of the Specifications complements the drawings in describing services, labour and materials necessary to complete supply, fabrication and placement of reinforcing steel necessary to complete the Work summarized as but not necessarily limited to:
  - .1 Footings and foundation walls
  - .2 Piers and pilasters
  - .3 Walls and columns
  - .4 Suspended slabs and slabs on steel deck
  - .5 Slabs on grade
  - .6 Duct banks
  - .7 Equipment bases
  - .8 Miscellaneous reinforcing steel
  - .9 Retaining walls
  - .10 Exterior flatwork and stairs

### **1.2 Related Work**

- .1 Concrete Formwork and Falsework                      Section 03 10 00
- .2 Cast-in-Place Concrete                                      Section 03 30 00

### **1.3 Reference Standards**

- .1 Do reinforcing work in accordance with CSA-A23.1-14 and welding of reinforcing in accordance with CSA W186-M1990, except where specified otherwise.

### **1.4 Source Quality Control**

- .1 Provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, prior to commencing reinforcing work.
- .2 Inform Consultant of proposed source of material to be supplied.

### **1.5 Shop Drawings**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Indicate sizes, spacing, location and quantities of reinforcement and mechanical splices, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacing and location of chairs, spacers and hangers. Do drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada.

- .3 Detail placement of reinforcing where special conditions occur.
- .4 Design and detail lap lengths and bar development lengths to CSA-A23.3-14, unless otherwise indicated.
- .5 Each shop drawing submitted shall bear the stamp and signature of a qualified professional engineering registered in Nova Scotia. This engineer shall ensure that the reinforcing steel has been detailed in accordance with the full intent of the contract documents.
- .6 Do not reproduce the structural drawings in the preparation of shop drawings.

## **1.6 Substitutes**

- .1 Substitution of different size bars permitted only upon written approval of the Consultant.

## **PART 2 – PRODUCTS**

### **2.1 Materials**

- .1 Reinforcing steel; billet steel, Grade 400, deformed bars to CAN/CSA-G30.18-09, Type R, unless indicated otherwise.
- .2 Reinforcing steel where welding required: weldable low alloy steel deformed bars to CAN/CSA-G30.18-09, Type W.
- .3 Cold-drawn annealed steel wire ties: to CSA G30.3-M1983.
- .4 Welded steel wire fabric: to CSA G30.15-M1983.
- .5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1-14.
- .6 Mechanical splices: subject to the approval of the Consultant.

### **2.2 Fabrication**

- .1 Fabricate reinforcing in accordance with CSA-A23.1-14, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Consultant's approval for locations of reinforcement splices other than shown on steel placing drawings.
- .3 Weld reinforcement in accordance with CSA W186-M1990.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar list.

## **PART 3 – EXECUTION**

### **3.1 Field Bending**

- .1 Do not field bend reinforcement except where indicated or authorized by the Consultant.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

### **3.2 Placing Reinforcement**

- .1 Place reinforcing steel as indicated on reviewed shop drawings and in accordance with CSA-A23.1-14, and as shown in landscape details.
- .2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of a thick even film of mineral lubricating grease.
- .3 Obtain Consultant's approval of reinforcing steel and position prior to placing concrete.
- .4 Ensure that appropriate cover to reinforcement is maintained during concrete pour.
- .5 Protect epoxy, galvanized and paint coated portions of reinforcing steel prior to placement.

### **3.3 Field Touch-up**

- .1 Touch up damaged and cut ends of coated or galvanized reinforcing with compatible finish to provide continuous coating.

**END OF SECTION**

Cast-In-Place Concrete

---

Read and be governed by conditions of the *Contract* and sections of Division 1.

## **PART 1– GENERAL**

### **1.1 Work Included**

- .1 This section of the Specifications complements the drawings in describing services, labour and materials necessary to complete supply, placing and finishing of cast-in-place concrete necessary to complete the Work summarized as but not necessarily limited to:
  - .1 Footings and foundation walls
  - .2 Piers and pilasters
  - .3 Walls and columns
  - .4 Suspended slabs and slabs on steel deck
  - .5 Slabs on grade
  - .6 Duct banks
  - .7 Equipment bases
  - .8 Miscellaneous concrete

### **1.2 Related Work**

- |                                       |                  |
|---------------------------------------|------------------|
| .1 Earthwork                          | Section 02 30 00 |
| .2 Concrete Formwork and Falsework    | Section 03 10 00 |
| .3 Integral Crystalline Waterproofing | Section 03 15 20 |
| .4 Concrete Reinforcement             | Section 03 20 00 |
| .5 Structural Steel                   | Section 05 12 00 |
| .6 Thermal Insulation                 | Section 07 21 00 |
| .7 Below Grade Vapour Barrier         | Section 07 21 16 |
| .8 Swimming Pool Tanks and Decks      | Section 13 11 13 |

### **1.3 Reference Standards**

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1-14, and testing in accordance with CSA-A23.2-14, except where specified otherwise.
- .2 CAN/CGSB-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .3 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 CAN/CSA-A23.5, Supplementary Cementing Materials.
- .5 CAN3-A266.1, Air-Entraining Admixtures for Concrete.
- .6 CAN3-A266.2, Chemical Admixtures for Concrete.
- .7 CAN3-A266.4, Guidelines for the Use of Admixtures in Concrete.
- .8 CAN/CSA A363, Cementitious Hydraulic Slag.

Cast-In-Place Concrete

---

## **1.4 Samples**

- .1 Submit samples in accordance with 01001 – General Requirements.

## **1.5 Certificate**

- .1 Minimum two weeks prior to starting concrete work submit to the Consultant manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements:
  - .1 Portland cement.
  - .2 Admixtures.
  - .3 Aggregates.
  - .4 Water.
  - .5 Waterstops.
  - .6 Waterstop joints.
  - .7 Joint filler.
- .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1-14. Concrete shall be produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current CSA Certificate of Ready Mixed Concrete Production Facilities as issued by the Association.
- .3 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CSA-A23.1-14.
- .4 Integral Crystalline Waterproofing:
  - .1 Refer to Section 03 15 20.

## **1.6 Quality Control**

- .1 Submit proposed quality control procedures for Consultant's approval.
- .2 Where concrete toppings are specified, the concrete flooring contractor shall assume responsibility for all aspects of the topping construction. This will include, but is not limited to the base course or substrate preparation, review of the concrete mix design, concrete supply, bonding agents, placing, finishing and curing etc.

## **PART 2 – PRODUCTS**

### **2.1 Materials**

- .1 Portland cement: to CSA-A3000-13.
- .2 Supplementary cementing materials: to CSA A3000-13.
- .3 Water: to CSA-A23.1-14.
- .4 Aggregates: to CSA-A23.1-14. Coarse aggregates to be normal density. Nominal size of course aggregate: 20mm. Use 10mm maximum size aggregate in toppings that are less than or equal to 75mm in thickness.

Cast-In-Place Concrete

---

- .5 Air entraining admixture: to CSA-A266.1-M78.
- .6 Chemical admixtures: to CSA-A266.4-M78.
- .7 Non-shrink grout: premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 35 MPa at 7 days.
- .8 Dry pack: premixed or non premixed composition of non metallic aggregate, cement and sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compression strength of 35 MPa at 7 days.
- .9 Ribbed waterstops: extruded PVC of sizes indicated with shop welded corner and intersecting pieces with legs not less than 510 mm long. PVC by Durajoint.
  - .1 Tensile strength: to ASTM D412-16, Die "C" method, minimum 1,650 psi.
  - .2 Elongation: to ASTM D412-16, Die "C" method, minimum 275%.
  - .3 Tear resistance: to ASTM D624-16, Die "B" method, minimum 3,300 lb/ft.
- .10 Waterstops for pool tanks and related surge tanks: in accordance with Section 13 11 13 Swimming Pool Tanks and Decks.
- .11 Premoulded joint fillers:
  - .1 Bituminous impregnated fiber board: to ASTM D1751-83.
- .12 Weep hole tubes: purpose made plastic type.
- .13 Dovetail anchor slots: minimum .6 mm thick galvanized steel with insulation filled slots.
- .14 Curing Compound:
  - .1 To CAN/CSA A23.1-14 white, and to ASTM C309 Type 1- Chlorinated Rubber.
  - .2 Clear curing compound equivalent for exterior concrete applications.
- .15 Anchor Bolts to ASTM A307.
- .16 Crystalline Waterproofing Admixture: In accordance with Section 03 15 20.
- .17 Bonding Agent: Sikadur 32 Hi-Mod epoxy-based protective coating and bonding adhesive, as supplied by Sika Canada, or approved equivalent.
- .18 Non-Shrink Grout: Minimum 30 MPa grout, as supplied by CPD Construction Products, or approved equivalent.

## 2.2 Concrete Mixes

- .1 Proportion normal density concrete in accordance with CSA-A23.1-14, Alternative 1, to give following properties: for concrete in footings, foundation walls, pilasters.
  - .1 Use Type 10 cement or mixture of cement and supplementary cementing materials to CSA-A3000-13.
  - .2 Minimum compressive strength at 28 days: 30 MPa.
  - .3 Class of exposure: F-2
  - .4 Nominal size of coarse aggregate: 20 mm.
  - .5 Slump at time and point of discharge: 75 mm.

Cast-In-Place Concrete

---

- .6 Air content: 4 to 7% for all elements except footings.
- .7 Chemical admixtures: to be in accordance with CSA-A266.4-78.
- .2 Proportion normal density concrete in accordance with CSA-A23.1-14, Alternative 1, to give following properties: for concrete in interior suspended slabs, columns, and walls.
  - .1 Use Type 10 cement or mixture of cement and supplementary cementing materials to CSA-A3000-13.
  - .2 Minimum compressive strength at 28 days: 30 MPa.
  - .3 Class of exposure: N
  - .4 Nominal size of coarse aggregate: 20 mm.
  - .5 Slump at time and point of discharge: 75 mm.
  - .6 Chemical admixtures: to be in accordance with CSA-A266.4-78.
- .3 Proportion normal density concrete in accordance with CSA-A23.1-14, Alternative 1, to give following properties: for concrete in interior slab on grade (except pool decks) and interior slab on steel deck.
  - .1 Use Type 10 cement or mixture of cement and supplementary cementing materials to CSA-A3000-13.
  - .2 Minimum compressive strength at 28 days: 25 MPa.
  - .3 Class of exposure: N
  - .4 Nominal size of coarse aggregate: 20 mm.
  - .5 Slump at time and point of discharge: 75 mm.
  - .6 Chemical admixtures: to be in accordance with CSA-A266.4-78.
- .4 Proportion normal density concrete in accordance with CSA-A23.1-09, Alternative 1, to give following properties: for concrete in exterior columns, exterior piers, exterior slabs on grade and exterior walks, curbs, retaining walls and stairs.
  - .1 Use Type 10 cement or mixture of cement and supplementary cementing materials to CSA-A3000-13.
  - .2 Minimum compressive strength at 28 days: 32 MPa.
  - .3 Class of exposure: C-2.
  - .4 Nominal size of coarse aggregate: 20 mm.
  - .5 Slump at time and point of discharge: 75 mm.
  - .6 Air content: 5 to 8%.
  - .7 Chemical admixtures: to be in accordance with CSA-A266.4-78.
- .5 Proportion normal density concrete in accordance with CSA-A23.1-09, Alternative 1, to give following properties: pool tanks, surge tanks, water storage tanks / watertight construction, pool decks.
  - .1 Use Type 40 low heat of hydration cement. Use of supplementary cementing materials and chemical admixture is subject to review by consultant.
  - .2 Minimum compressive strength at 28 days: 35MPa, maximum w/c ratio to be 0.40 .

### Cast-In-Place Concrete

---

- .3 Class of exposure: C-1.
- .4 Nominal size of coarse aggregate: 20 mm.
- .5 Slump at time and point of discharge: walls 90mm maximum , slabs 50mm maximum.
- .6 Air content: 5 to 8%.
- .7 Crystalline waterproofing admixture to manufacturer's recommendations.
- .8 Chemical admixtures: to be in accordance with CSA-A266.4-78.
- .6 Do not change concrete mix without prior approval of Consultant. Should change in material source be proposed, new mix design to be approved by Consultant.
- .7 The use of calcium chloride in the concrete is not permitted.

## PART 3 – EXECUTION

### 3.1 Workmanship

- .1 Obtain Consultant's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place 20M steel dowels of deformed steel reinforcing bars at 460 mm o.c. and pack solidly with non-shrink grout to positively position and anchor dowels.
- .7 Coordinate concrete for landscape applications with landscape details.
- .8 Tolerances: Dimensional tolerances to CAN/CSA-A23.1-14, straight edge method for a conventional slab on grade.
- .9 Ready mix plant shall conform to CSA and possess a current and active membership in the Atlantic Provinces Ready Mix Concrete Association.
- .10 Protect previous exposed work from staining.
- .11 Clean and remove stains on exposed work prior to application of concrete finishes.
- .12 Ensure a clean, smooth joint when pouring against existing concrete.

### 3.2 Pool Tank Construction

- .1 Surveying and tolerances of pool tanks:
  - .1 Surveying and tolerances of the pool tanks shall be in accordance with requirements contained in the Architectural specifications and drawings (Division 13).

Cast-In-Place Concrete

---

.2 Pool tank construction:

- .1 Install all pool tank related concrete ensuring proper placement to achieve full consolidation and to avoid any honey-combing or open areas.
- .2 All ferrous materials, including form ties are to be held a minimum of 25 mm back from the face of concrete. Fill ties holes with an approved concrete protective and bonding compound.
- .3 After removal of forms, and before concrete has dried out, all imperfections such as rod holes, voids, stone pockets, etc. shall be cut out (cutting back if necessary to steel or further to the extent of void or honey combing) and patched, using an approved protective and bonding compound.
- .4 Moist cure of all concrete tank elements in accordance with requirements of CAN/CSA-A23.11 for a curing period of seven (7) days. Submit proposed curing methods to the Consultant for review.

.3 Waterstops:

- .1 Install continuous waterstops where indicated or required to prevent leakage, and to manufacturer's instructions. Build waterstops into forms and support against displacement during pouring of concrete. Do not displace concrete reinforcing when installing waterstops.
- .2 Use butted, welded connections in accordance with manufacturer's recommendation. Only straight heat sealed welds shall be performed in the field. Use preformed or shop welded corners and intersections.

.4 Finishing – pool and pool related tanks:

- .1 Concrete finishing with in the pool area (vertical, formed and horizontal surfaces) shall be in accordance with requirements contained in the Architectural specifications and drawings (Division 13).

.5 Water-Tightness of pool tanks:

- .1 Testing procedures for the water-tightness of the pool tanks shall be in accordance with requirements contained in the Architectural specifications and drawings (Division 13).

**3.3 Inserts**

- .1 Set sleeves, ties, pipe hangers and other inserts, and openings as indicated or specified elsewhere. Sleeves and openings greater than 102 mm x 102 mm not indicated on structural drawings must be approved by Consultant.
- .2 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where expressly detailed on structural drawings or approved by Consultant.
- .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of all modifications from Consultant before placing concrete.
- .4 Check locations and sizes of sleeves and openings shown on structural and civil drawings with architectural, mechanical and electrical drawings.
- .5 Anchor bolts:

### Cast-In-Place Concrete

---

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.6 Drainage holes and weep holes:

.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Formwork and Falsework. If wood forms are used, remove them after concrete has set.

.2 Install weep hole tubes and drains as indicated.

### 3.4 Grouting

.1 Grout underside of steel column and beam bearing plates with non-shrinking grout to manufacturer's instructions. Place grout to cover steel shims left in place.

### 3.5 Placing

.1 Place concrete to CSA A23.1, Section 7.

.2 Convey concrete from mixer to forms by methods that will maintain specified slump and prevent segregation.

.3 Place concrete so that the concrete will not segregate. Deposit concrete in final position in forms to avoid lateral movement.

.4 Place concrete in continuous operation, starting from lowest point in form, in lifts not greater than 500 mm.

.5 Vibrate or tamp each layer to obtain dense homogeneous structure free of cold joints, fill planes, voids and honeycombing. For vertical installation vibrate at least 150 mm into previously placed layers. Concrete to be well bonded to all reinforcing steel, anchors, waters tops and other embedded parts.

### 3.6 Curing and Protection (for exterior exposed work)

.1 Provide curing and protection to CSA A23.1, Section 7.4. The temperature of the concrete as placed to be within the limits of Table 14. Use clear curing compound.

.2 Do not place concrete on frozen base. Remove all snow, ice and frost from area prior to placing concrete. Do not place concrete on, or against, any surface that will lower the temperature of the concrete in place below the minimum concrete in place below the minimum value shown in Table 14.

.3 When air temperature may drop below 5°C or when there is a probability that it will drop below 5°C within 24 hours of placing, raise temperature of base, reinforcing steel, embedded parts and concrete. In addition, before placement have available all materials and curing.

.4 When air temperature is at or above 27°C, or when there is a probability of its rising to 27°C during the placing period, provide facilities for protection of concrete in place from effects of hot and/or drying weather conditions. Under severe drying conditions, protect formwork reinforcement and concreting equipment from direct rays of sun, or cool by fogging.

.5 After placing is completed, maintain minimum curing conditions for the concrete in accordance with CSA-A23.1, Section 7.4.

Cast-In-Place Concrete

---

### **3.7 Finishing**

- .1 Finish concrete in accordance with CSA-A23.1-14.
- .2 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise detailed.
- .3 Fill form tie holes with non-shrink mortar that is approved by the tile waterproofing supplier and finish to texture of adjacent concrete.
- .4 Finish floor slabs to CSA-A23.1-14. Provide a class A steel trowelled finish. In addition, ensure that minimum level of concrete floors are within 6 mm of established elevations in any 6000 mm square area, and that floors are sufficiently even to contact a 3 m long straight edge with a tolerance of 6 mm.
- .5 Finish of concrete slabs in the pool as required by the tile installer.

### **3.8 Curing**

- .1 Cure all concrete in accordance with CSA-A23.1-14.
- .2 Ensure curing compound used will be compatible with finished surfaces and flooring materials to be applied over slabs

### **3.9 Waterstops**

- .1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
- .2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections. Field weld only with the approval of the Consultant.

### **3.10 Joint Fillers**

- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .2 Locate and form isolation and expansion joints as
- .3 indicated. Install joint filler.
- .4 Use 12 mm thick joint filler to separate slabs-on- grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

### **3.11 Anchor Bolts**

- .1 Place anchor bolts to template to match steel base plate layout.
- .2 Anchor bolts to be securely maintained in place during concrete placing.
- .3 Anchor bolt threads to be protected from damage during concrete placing. Cover threaded section of anchor bolt to prevent contamination from plastic concrete.

### **3.12 Construction Joints**

- .1 Obtain approval from consultant for location and details of construction joints not shown.

Cast-In-Place Concrete

---

- .2 The maximum length of a concrete slab pour shall be 40m.
- .3 The maximum length of a concrete foundation wall pour shall be 15m.
- .4 The maximum height of a concrete pour shall be 5m.

**3.13 Sloping Slabs**

- .1 Employ suitable concrete placing and compaction procedures to ensure that compacted concrete has the specified design characteristics and that movement of plastic concrete which would result in cracking, loss of bond, etc. is prevented.

**3.14 Pool Tanks, Surge Tanks (Water Tight Construction)**

- .1 Conform with the requirements of this section and the following for the construction of the components designated to be watertight.
- .2 Temperature control
  - .1 Concrete temperature at time of delivery 27 deg C maximum, 18 deg C minimum.
  - .2 Maximum cooling rate not to exceed 7 deg C per day.
  - .3 In the case of the base slab, employ a temperature monitoring system during each pour to determine the internal concrete temperature at regular intervals. Submit details of the proposed monitoring system to the Consultant for review.
- .3 Curing; maintain 7 days continuous wet curing after the placing of the concrete. Provide an approved membrane waterproofing immediately thereafter.
- .4 Crack Repair; Prior to the water test, carefully examine all exposed interior and exterior surfaces and repair any cracks in them.

**3.15 Reglets**

- .1 Reglets to receive crystalline mortar at bottom and wall corners.

**3.16 Field Quality Control**

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the Owner and in accordance with CSA-A23.1-14, using a certified concrete laboratory.
- .2 The Owner will pay for costs of tests.
- .3 Inspection or testing will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

**3.17 Defective Work**

- .1 Remediate defective concrete or remove and replace concrete not in accordance with these specifications, blemishes and embedded debris, and repair as directed.

**END OF SECTION**

Concrete Floor Finishing

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Concrete floor finishing, including:
    - .1 Sealed concrete; typical (CSLR1): Membrane forming curing compound; interior grade.
    - .2 Penetrating liquid concrete floor treatment (CSLR2).
    - .3 Non-slip inserts concrete inserts.

### **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.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Execute the work of this section only by a *Subcontractor* who has adequate equipment and skilled workers to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified.

### **1.5 Field Conditions**

- .1 Perform work only when environmental conditions are as specified in Section 03 30 00.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Membrane forming curing compound; interior grade (CSLR1):
  - .1 Water-based: transparent, to ASTM C309-11, Type 1, Class B, VOC-compliant, in a true-water based carrier.
  - .2 Acceptable *Products*:
    - .1 W.R. Meadows Inc. 'VOCOMP-30'.
    - .2 Sika Canada Inc. 'Florseal WB 25'.
    - .3 Substitutions: in accordance with Section 01 25 00.
- .2 Penetrating liquid concrete floor treatment (CSLR2), chemically reactive, premium formula requires removal of application formula:

### Concrete Floor Finishing

---

- .1 Water-based, chemically reactive liquid densifier and chemical hardening compound: One-component liquid sodium silicate surface hardener. Odourless, colourless, biodegradable, VOC compliant and reacts chemically to produce a hard, dust-free finish.
- .2 Acceptable *Products*:
  - .1 Curecrete Distribution Inc. 'Ashford Formula'.
  - .2 The Euclid Chemical Company 'Euco Diamond Hard'.
  - .3 W.R. Meadows 'Liqui-Hard'.
- .3 Non-slip inserts:
  - .1 Basis of design:
    - .1 Wooster 'Stairmaster Type 630', colour as selected by Consultant.

## PART 3 - EXECUTION

### 3.1 General

- .1 Before commencing work of this section, ensure that surfaces are acceptable to receive and maintain concrete finishing, and that specified installation will be achieved.

### 3.2 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. Ensure that floating embeds large aggregate below surface, consolidates mortar at surface, with even planes, without humps or depressions, removes marks from edging, and prepares 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.

### Concrete Floor Finishing

---

- .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, mortar setting beds for bonded cementitious 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 finish and where scheduled or indicated.
- .4 Trowel finish: After applying float finish, apply first trowelling and consolidate concrete by hand or power-driven trowel. Continue trowelling passes and restraighten 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 indicated, exposed to view or to be covered with floor finishing materials and as indicated or scheduled.
- .5 Trowel and fine-broom finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry or other hard surface tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
  - .1 Apply trowel and fine-broom finish to interior concrete areas as indicated.
  - .2 Apply trowel and fine-broom finish to ceramic or quarry or other hard surface tile is to be installed by either thickset or 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.
- .7 Polished concrete:
  - .1 Apply polished concrete finish to interior concrete areas as indicated or scheduled.
  - .2 Screeding shall be completed using a non-vibrating screed when deep ground polished concrete is specified as a final finish.
  - .3 Finishers shall not walk in wet concrete and should wait until the concrete has set before walking on the surface.
  - .4 After applying float finish, apply first trowelling and consolidate concrete by hand or power-driven trowel. Continue trowelling passes and restraighten 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 a trowel finish to surfaces indicated or scheduled in accordance with Section 03 35 03.
    - .2 Follow manufacturer's recommended procedures for vibration and protection to provide uniform and stain-free appearance.
- .8 Non-slip strips:
  - .1 Apply non-slip strips to concrete stair areas as indicated or scheduled.

## Concrete Floor Finishing

---

### 3.3 Concrete Slab Surface Finishing Tolerances

- .1 Comply with tolerances required by building code.
- .2 Concrete tolerances: F-number in accordance with CAN/CSA A23.1/A23.2-09.
  - .1 Polished concrete surface: in accordance with Section 03 35 03.
  - .2 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:  $F_F 25 - F_L 20$ .
- .3 Measure f-number finish tolerance requirements in accordance with CAN/CSA A23.1/A23.2-09 and submit log records of measurements.
- .4 Independent testing company may measure for *F*-number finish tolerance requirements in accordance with CAN/CSA A23.1/A23.2-09, in accordance with Section 01 45 00. Provide 4 *Working Days* notice in advance of concrete flooring placement and finishing.

### 3.4 Concrete Curing and Drying

- .1 Cure concrete as specified in CAN/CSA A23.1/A23.2-09 and by methods indicated elsewhere in the *Contract Documents*. Do not use curing or parting compounds on floors scheduled to receive floor finish materials.
- .2 Concrete slabs shall be properly cured and dried before installation of flooring finish materials. Drying time before slabs are ready for moisture testing will vary depending on atmospheric conditions, mechanical ventilation, and mix design. After curing period protect concrete slabs to receive finish flooring from precipitation or *Provide* mechanical ventilation to maintain schedule.
- .3 Install in accordance with manufacturer's written installation instructions.

### 3.5 Membrane Forming Curing Compound Installation

- .1 Install in accordance with manufacturer's written installation instructions.
- .2 Apply curing-sealing compound to new concrete as soon as the concrete is firm enough to work on after towelling.
- .3 Spray on in a fine, fog pattern without spurts and dribbles to form a thin, continuous film. Avoid puddles in low areas and if puddles occur, brush or roll them out.
- .4 Apply 2 coats of curing-sealing compound at right angles. Apply second coat immediately prior to date of *Substantial Performance of the Work*.
- .5 Install in accordance with manufacturer's written installation instructions.

### 3.6 Penetrating Liquid Concrete Floor Treatment; Chemically Reactive

- .1 Install in accordance with manufacturer's written requirements.

### 3.7 Patching and Refinishing

- .1 Before completion of the *Work*, patch and refinish defective surfaces to match surrounding areas with no discernible variation in appearance.

Concrete Floor Finishing

---

**3.8 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**

Precast Structural Concrete

---

Read and be governed by conditions of the *Contract* and sections of Division 1.

## **PART 1 – GENERAL**

### **1.1 Related Sections**

- .1 Concrete Reinforcement                      Section 03 20 00
- .2 Cast-in-Place Concrete                      Section 03 30 00

### **1.2 Measurement Procedures**

- .1 Measure precast elements in units supplied, delivered, stored and erected.
- .2 Precast elements measured as individual units, will include cost, supply, delivery, storage and full and complete installation and cleaning if required.

### **1.3 References**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
  - .2 CAN/CGSB-1.181-92, Ready Mixed Organic Zinc-Rich Coating.
  - .3 CAN/CGSB-51.20-M87, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .2 Canadian Standards Association (CSA)
  - .1 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
  - .2 A23.3-14, Design of Concrete Structures for Buildings.
  - .3 A23.4-14, Precast Concrete - Materials and Construction.
  - .4 A251-M1982R1998), Qualification Code for Manufacturers of Architectural and Structural Precast Concrete.
  - .5 CSA-G30.15-M1983(R1991)(R1998), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

### **1.4 Design Requirements**

- .1 Design precast elements to CSA A23.3 to carry handling stresses.
- .2 Design precast elements to carry loads specified by the Engineer or as indicated, in accordance with the National Building Code of Canada 2015.
- .4 Design connections/attachments of precast elements to load/forces specified by the Engineer.
- .5 Submit detailed calculations and design drawings for typical precast elements and connections to the Engineer for review and approval 2 weeks prior to manufacture.

Precast Structural Concrete

---

## **1.5 Performance Requirements**

- .1 Tolerance of precast elements to CSA A23.4, Section 10.
- .2 Length of precast elements not to vary from design length by more than plus or minus 6 mm.
- .3 Cross sectional dimensions of precast elements not to vary from design dimensions by more than plus or minus 6 mm.

## **1.6 Shop Drawings**

- .1 Submit shop drawings in accordance with Section 01 33 00 and in accordance with CSA A23.2.
- .2 Include the following items:
  - .1 Design calculations for items designed by manufacturer.
  - .2 Details of prestressed and non-prestressed members, reinforcement and their connections.
  - .3 Camber.
  - .4 Finishing schedules.
  - .5 Methods of handling and erection.
  - .6 Openings, sleeves, inserts and related reinforcement.
- .3 Ensure each drawing submitted bears stamp and signature of qualified professional engineer registered or licensed in the Province of Nova Scotia, Canada.

## **1.7 Samples**

- .1 Submit samples in accordance with Section 01 33 00.
- .2 Supply finish samples for each finish to be used and requested by the Architect.

## **1.8 Qualifications**

- .1 Precast concrete elements to be fabricated and erected by manufacturing plant certified by Canadian Standards Association in appropriate categories according to CSA-A251.
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender and to specifically verify as part of tender that plant is currently certified in appropriate categories, Structural and Architectural.
- .3 Only precast elements fabricated in such certified plants to be acceptable to owner, and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Cement, aggregates, water, admixtures: to CSA-A23.1 and CSA-A23.4.
- .2 Reinforcing steel: to CSA-G30.18.
- .3 Welded wire fabric: to CSA-G30.15.
- .4 Hardware and miscellaneous materials: to CSA-A23.1.
- .5 Forms: to CSA A23.4.
- .7 Anchors and supports: to CSA G40.21 Type 300 W.
- .8 Welding materials: to CSA-W48.1.
- .9 Welding electrodes: to CSA-W48.1 and certified by Canadian Welding Bureau.
- .10 Galvanizing: hot dipped galvanizing with minimum zinc coating of 600 g/m<sup>2</sup> to CSA-G164.
- .11 Steel primer: to CAN/CGSB-1.40.
- .13 Zinc-rich primer: to CAN/CGSB-1.181.

### **2.2 Mixes**

- .1 Concrete.
  - .1 Minimum compressive strength at 28 days: 30 MPa.
  - .2 Class of exposure: C1
  - .3 Nominal size of coarse aggregate: 20 mm.
  - .4 Air content: 5 to 8%.
- .2 Grout.
  - .1 Cement grout: 1 part Portland cement to 3 parts sand, sufficient water for placement and hydration.
  - .2 Minimum compressive strength: 25 MPa.
  - .3 Shrinkage compensating grout: to Section 03 30 00 - Cast-in-Place Concrete.

### **2.3 Finishes**

- .1 Finish units to architectural specification.

### **2.4 Source Quality Control**

- .1 Provide the Engineer with copies of quality control tests related to this project as specified in CSA A23.23.4.
- .2 Upon request, provide the Engineer with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

Precast Structural Concrete

---

- .3 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to the Engineer for review upon request.

## **PART 3 - EXECUTION**

### **3.1 Erection**

- .1 Do precast concrete work in accordance with CSA A23.4.
- .2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.
- .4 Erect precast elements within allowable tolerances as specified.
- .5 Non-cumulative erection tolerances in accordance with CSA A23-4, Section 10.
- .7 Set elevations and alignment between units to within allowable tolerances before connecting units.
- .9 Grout underside of unit bearing plates with shrinkage compensating grout.
- .10 Fasten precast units in place as indicated on reviewed and approved shop drawings.
- .11 Uniformly tighten bolted connections with torque indicated.
- .12 Do not weld or secure bearing plates at sliding joints.
- .13 Clean field welds with wire brush and touch-up with galvanized finish with zinc-rich primer.

### **3.2 Cleaning**

- .1 Obtain approval of cleaning methods from the Engineer before cleaning soiled precast concrete surfaces.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Architectural precast concrete fabrications (APC), complete with drips, to profiles as indicated including:
    - .1 Exterior concrete bases.
    - .2 Pedestrian link/bridge over infiltration trench.
    - .3 Interior architectural precast concrete at Pool Corridor and Multipurpose Room.
    - .4 Interior architectural precast concrete at Aquatic Hall benches.
    - .5 Interior architectural precast concrete at structural slab over Lane Rope Storage.
  - .2 Steel inserts and anchors for precast installation.

### **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.
- .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 The work of this section shall be executed only by a *Subcontractor* with proven experience in the design and manufacture of precast concrete and having 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 shall be qualified in accordance with CSA A23.4-16.

Architectural Precast Concrete Fabrications

---

- .3 The manufacturer shall be responsible for the design, connections, and installation of the precast concrete units.
- .4 Aspects of the work of this section are required to be prepared by a professional engineer. Refer to Section 01 33 00 for specific details and requirements in this regard.

## **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/CAN/CSA A23.3-04.
- .2 Slope top surfaces of exterior precast minimum 2%.
- .3 Provide drip section to bottom edge of exterior precast to break drainage water flow.

### **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. Under no circumstances, use calcium chloride on an admixture containing calcium chloride. 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-16a. Galvanize reinforcing with less than 25 mm (1") cover.
  - .6 Metal precast anchor and hardware finish: hot dip galvanizing to CAN/CSA G164-M92 unless otherwise indicated. Paint welds and damaged areas of galvanized with zinc-rich touch-up paint before and after erection.

Architectural Precast Concrete Fabrications

---

- .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.
- .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, BASF Building Systems or approved alternative.
- .2 Finish on exposed surfaces of precast concrete shall be grey or white, to *Consultant's* selection, with smooth finish and as follows:
  - .1 Colour and texture: CPCI finish code CPCI-149.

## PART 3- EXECUTION

### 3.1 Installation

- .1 Erect precast concrete units in accordance with CSA A23.4-16/CAN/CSA A23.3-04 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.
- .1 Manufacturer's field review to be in accordance with Section 01 45 00.
- .2 Rejection of work:

---

Architectural Precast Concrete Fabrications

---

- .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 which are defined as surface cracks of minute width, visible but not measurable by ordinary means, units which have become cracked or broken will be rejected.

### **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 and as follows:
  - .1 Independent inspection and testing company shall attend the pre-installation meeting.
  - .2 *Subcontractors* required to attend the pre-installation meeting in addition to the *Subcontractor* for the work of this section shall include *Subcontractors* responsible for air barriers, siding/roofing, and glazing systems.

#### 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 for masonry unit wall assemblies for walls that are to act as guards.
  - .3 Submit engineered shop drawings for the following:
    - .1 Masonry reinforcement.
    - .2 Masonry ties and connectors.
- .4 Samples:
  - .1 2 of each type of concrete masonry unit specified.
  - .2 2 of each type of architectural concrete masonry unit specified including corner units and in varying degrees of "roughness" or texture.
  - .3 1 of each type of masonry accessory specified
  - .4 1 of each type of masonry reinforcement and tie proposed for use.

## Masonry Procedures

---

### 1.4 Quality Assurance

#### .1 Qualifications:

- .1 Installers / applicators / erectors: *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 of *Product* manufacturers.

#### .1 Mock-ups:

- .1 Architectural concrete masonry units; exterior masonry faced assemblies:

- .1 Construct sample panels approximately 900 mm x 900 mm (36" x 36") of exterior masonry faced assemblies showing:

- .1 Coursing type.

- .2 Concrete masonry units; block wall partitions and masonry back-up:

- .1 Construct sample panels approximately 900 mm x 900 mm (36" x 36") of concrete masonry partition assemblies showing:

- .1 Transparent sealer or paint finishes.

- .2 Coursing type.

- .3 Accepted mock-ups may remain as part of the completed *Work*.

### 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.
- .4 Masonry units, cementitious materials, and sand stored on site shall be protected from contaminants and shall not be wetted by rain, snow, or groundwater. Other materials and components to be installed by the mason shall be handled and stored in accordance with the manufacturer's instructions.
- .5 When work is not in progress, the exposed top surfaces of masonry shall be covered to prevent intrusion of precipitation with non-staining coverings. The cover shall extend a minimum of 600 mm (24") down both sides and shall be held securely in place until masonry work is protected by flashings or other permanent construction. Ensure that coverings are secured to resist wind loads.

### 1.6 Field Conditions

#### .1 Cold weather construction requirements:

- .1 Comply with requirements of CAN/CSA A371-04, 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.

### Masonry Procedures

	(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 A371-04, 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

- .3 Hot weather construction requirements:
  - .1 Comply with requirements of CAN/CSA A371-04, 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.
  - .4 Masonry units, cementitious materials, and sand stored on site shall be protected from contaminants and shall not be wetted by rain, snow, or groundwater. Other materials and components to be installed by the mason shall be handled and stored in accordance with the manufacturer's instructions.
  - .5 When work is not in progress, the exposed top surfaces of masonry shall be covered to prevent intrusion of precipitation with non-staining coverings. The cover shall extend a minimum of 600 mm (24") down both sides and shall be held securely in place until masonry work is protected by flashings or other permanent construction. Ensure that coverings are secured to resist wind loads.

Masonry Procedures

---

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Architectural precast fabrications: in accordance with Section 03 48 00.
- .2 Mortar and grout for masonry: in accordance with Section 04 05 13.
- .3 Masonry reinforcement and connectors: in accordance with Section 04 05 19.
- .4 Masonry accessories: in accordance with Section 04 05 23.
- .5 Concrete masonry units: in accordance with Section 04 22 00.
- .6 Architectural concrete masonry units: in accordance with Section 04 22 23.

## **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 A371-04.
- .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 A179-04 except where specified otherwise.
- .4 Masonry work: CSA S304.1-04, CAN/CSA A370-04 and CAN/CSA A371-04 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:
    - .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 storey 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:

### Masonry Procedures

---

- .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 Concrete masonry units:
    - .1 Two thirds running bond, locations as indicated.
    - .2 Stack bond, locations as indicated.
- .2 Installation and materials shall meet or exceed that of accepted samples and mock-up.
- .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.
- .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 instructions. 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.

### Masonry Procedures

---

- .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.
- .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 concrete unit masonry:
    - .1 Concave.
  - .2 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.
  - .3 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").

### Masonry Procedures

---

- .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.
  - .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 A371-04.
- .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 all 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 35 MPa.

## Masonry Procedures

---

### 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 in accordance with Structural Drawings.
- .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.

### 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 A370-04.

### 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 S304.1-04.

### 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 printed instructions. 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 printed directions.

### Masonry Procedures

---

- .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.
- .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.
- .10 Remove efflorescence and mortar deposits from surfaces to receive coatings or surfaces which are exposed to view, occurring within a time period of 1 year after date of *Substantial Performance of the Work*.

#### **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: Submit test results confirming compliance of aggregates with CAN/CSA A179-04.

### **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 A179-04.
- .2 Portland cement: to CSA A3001-08, Type 10. For exposed mortar, maintain uniformity of cement manufacturer and batch for colour uniformity.
- .3 Hydrated lime: to ASTM C207-06(2011), Type S.
- .4 Sand: to CAN/CSA A179-04.

### **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 foundation walls, manholes, sewers, pavements, walks, patios and other exterior masonry at or below grade: Type S.
- .2 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.
- .3 Mortar; ready mixed for foundation walls; at or below grade: Type S based on proportion specifications.
- .4 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:
  - .1 Concrete masonry units: Control mortar materials and workmanship to produce uniform grey colour (non-pigmented).

## **2.5 Grout Types**

- .1 Grout for masonry: Grout to CAN/CSA A179-04.
  - .1 Compressive strength:
    - .1 20 MPa minimum unless otherwise indicated.
    - .2 Beneath bearing plates: 35 MPa.
  - .2 Slump: 200 mm (8") unless otherwise indicated.
- .2 Grout for hollow metal frames: Fine grout to CAN/CSA A179-04.
  - .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 A179-04, except where indicated otherwise.

### **3.2 Measurement and Mixing**

- .1 Mix mortars and grout as specified in CAN/CSA A179-04 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 A371-04, and as indicated.

### **3.4 Field Quality Control**

- .1 *Provide* mortar for strength testing in accordance with CAN/CSA A179-04 and Section 01 45 00.

### **3.5 Protection**

- .1 *Provide* protection where required at mixing areas to prevent damage attributed to materials of this section.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Masonry reinforcing and anchorage.
  - .2 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 A370-04.
- .2 Corrosion protection; metal materials: in accordance with building code and CAN/CSA A370-04:
  - .1 Hot dipped after fabrication to ASTM A1064/A1064M-16b, and ASTM A153/A153M-09 Class B2 (457 g/m<sup>2</sup>).
    - .1 Interior to air barrier location: Use mill galvanized.
  - .2 For metal located exterior to the air barrier membrane: Stainless steel Type 304/316.
- .3 Joint reinforcement:
  - .1 Basis of design: Blok-Lok.
  - .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 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.

### **3.2 Horizontal Reinforcing**

- .1 Joint reinforcement:
  - .1 Install horizontal joint reinforcement in cavity walls, solid walls, and partitions in accordance with CAN/CSA A371-04 and as indicated in the *Contract Documents*, the more stringent requirements shall govern.

Masonry Reinforcement and Connectors

---

- .2 Place reinforcement continuously in horizontal joints at vertical spacing not exceeding 600 mm (24"), 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.

### **3.3 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 S304.1-04. 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.

### **3.4 Bolts and Anchors**

- .1 Embed bolts and anchors solidly in mortar or grout to develop maximum resistance to design forces.

### **3.5 Lateral Support and Anchorage**

- .1 Install lateral support and anchorage in accordance with CAN/CSA A370-04 and as indicated on the structural drawings.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Masonry through wall membrane flashing at exterior masonry wall assemblies.
  - .2 Metal flashing at masonry wall assemblies.
  - .3 Deflection space filler at top of non-fire rated masonry partitions.
  - .4 Deflection space filler at top of fire-rated masonry partitions.
  - .5 Preformed movement (control) joint filler at concrete walls/partition assemblies.
  - .6 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 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 instructions.
    - .3 SBS rubberised 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 3M '3015 TWF'.
      - .2 Carlisle: CCW-705 TWF.
      - .3 Grace 'Perm-A-Barrier Wall Flashing'.
      - .4 Henry Company 'Bakor Blueskin TWF'.
      - .5 Soprema 'Soprseal Stick 130-S'.
      - .6 Tremco 'ExoAir TWF'.
      - .7 W.R. Meadows 'Air-Shield Thru-Wall Flashing'.

Masonry Accessories

---

- .2 Metal flashing: in accordance with Section 07 62 00.
  - .1 Lap sealant:
    - .1 Basis of design: Bakor 'Air-bloc-21'.
- .3 Deflection space filler (non-fire rated walls):
  - .1 Acceptable *Products*:
    - .1 Johns Manville 'MinWool Sound Attenuation Fire Batts'.
    - .2 Rockwool "AFB".
    - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Deflection space filler (fire rated walls):
  - .1 Mineral type in accordance with Section 07 84 00.
- .5 Movement joint filler; concrete block wythes:
  - .1 PVC, designed to fit into sash grooves.
  - .2 Basis of design: Blok-Lok 'VS Series'.
- .6 Slip-sheet flashing membrane (for lintel bearing locations):
  - .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.
    - .3 Substitutions: in accordance with Section 01 25 00.

## **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 manufacturer's recommendations.

### **3.3 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 A371-04.

---

Masonry Accessories

---

- .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 instructions.
- .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 Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- .5 Flashings shall be installed to shed water in masonry cavity to exterior. Make flashings watertight.
- .6 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.

### **3.4 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.

### **3.5 Slip Sheet at Metal Lintels**

- .1 Install at loose lintel locations between bearing area of lintel and bed. Trim away exposed slip sheet.

**END OF SECTION**

Concrete Masonry Units

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Concrete masonry units:
    - .1 Normal weight units.
    - .2 Light 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 Comply with CAN/CSA A165 SERIES-04.
  - .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 *Provide* bullnose units at interior partition outside corners and where indicated.
  - .4 Solid concrete masonry units may be used where grouted block is indicated, whenever reinforcing is not indicated, in lieu of grouted solid installation method.
  - .5 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-04.

**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 A371-04, as accepted in mock-up sample wall and in accordance with Section 04 05 00.
- .2 Exposed corners at interior partitions shall utilise units with bullnose corners. At exterior exposed corners, extent of bullnose to be as indicated.

**END OF SECTION**

Structural Steel

---

Read and be governed by conditions of the *Contract* and sections of Division 1.

## **PART 1 – GENERAL**

### **1.1 Work Included**

- .1 This section of the Specifications complements the drawings in describing services, labour and materials necessary to complete supply, fabrication and erection of structural steel necessary to complete the work summarized as but not necessarily limited to:
  - .1 Roofs and floors
  - .2 Columns
  - .3 Wall supports
  - .4 Miscellaneous structural items

### **1.2 Related Work**

- .1 Steel Joists Section 05 21 00
- .2 Steel Decking Section 05 31 00
- .3 Paint Systems and Anti Corrosion Schedule Section 09 91 01
- .4 Paint and Steel Preparation for Paint Systems Section 09 91 00
- .5 Paint and Steel Preparation for High Performance Paint Systems Section 09 96 13

### **1.3 Reference Standards**

- .1 Do structural steel in accordance with CSA-S16-14 and CSA-S136-16, except where specified otherwise.
- .2 Do welding in accordance with CSA W59-13, except where specified otherwise.
- .3 SSPC-SP6 – Steel Structures Painting Council, Commercial Blast Cleaning Standard.
- .4 ASTM A307, Specification for Carbon Steel Bolts and Studs.
- .5 ASTM A325, Specification for Structural Bolts, Steel, Heat Treated.
- .6 CSA-G40.20, CSA-G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
- .7 CSA-W48, Filler Metals and Allied Materials for Metal Arc Welding

### **1.4 Qualifications**

- .1 Execute work of this Section only by a structural steel fabricator who is fully accredited and a current member of the Canadian Institute of Steel Construction, or who has received approval in writing no less than one week before tender closing.
- .2 Perform welding only by a fabricator fully certified to the conditions of CSA Qualifications Code W55.3-1965 or W47.1-92, Division 1 or Division 2.1. Conform to CSA Standard CSA-S16-14 where requirements are at variance.

Structural Steel

---

### **1.5 Architecturally Exposed Steel**

- .1 Architecturally exposed steel is all steel which is left exposed to view in the completed building.
- .2 The “as fabricated and erected” straightness tolerances of architecturally exposed structural steel members shall not exceed  $\frac{1}{2}$  of the standard camber and sweep tolerances specified in G40.20, unless otherwise noted.

### **1.6 Source Quality Control**

- .1 Submit two certified copies of mill reports covering chemical and physical properties of steel used in this work.

### **1.7 Design of Details and Connections**

- .1 Unless otherwise noted, the fabricator's engineer shall design and be solely responsible for all connections between all steel members including, but not limited to columns, beams, girders, joists and braces, and between such members as spandrel angles and beams, hangers, stiffeners, etc., and their supporting members be they steel or concrete.
- .2 Unless otherwise noted, the fabricator's engineer shall also design and be responsible for specifying stiffeners, doubler plates and the like, required to maintain the local strength and stability of a member and where these stiffeners and doubler plates become an integral part of the connection or where they affect the connection of other steel framing members. Typical examples include, but are not limited to cranked sections, moment connections between columns and beams, connections to hollow structural sections and the like. Where connections are exposed to view, the detailing of stiffeners, double plates and the like is subject to review by the Architect.
- .3 Design connections to safely withstand the combined primary effects of axial forces, shear, moment and torque and any secondary effects due to welding.
- .4 Where no axial force is shown for beam to column connections, connect beams framing into column such that the combined capacities of the connection are able to resist a total horizontal force of 1% of the factored axial load in the column, in each direction.
- .5 Unless otherwise noted, the design of all beams and girders is based on the assumption that fastener holes through flanges will not exceed 15% of the gross flange area. If the area of holes exceeds 15%, the member size shall be altered or reinforced accordingly.
- .6 Design connections that are exposed to weather so that moisture, foreign matter, and the like cannot be trapped or gain entry to the interior of hollow built-up members.
- .7 Design and detail connections so as not to encroach upon architectural clearance lines or finishes.
- .8 Where connections between beams and columns and the like result in a loss of bearing to the steel deck, design and provide support for the steel deck.
- .9 Design and provide end bearing connections of inclined members such that the bearing plane between the inclined members and their supporting members is horizontal.
- .10 Design details and connections in accordance with requirements of CSA-S16-14 and CSA-S136-16 to resist forces, moments and shears indicated.

## Structural Steel

---

- .11 For non-standard connections, submit sketches and design calculations stamped and signed by qualified professional engineer registered in province of Nova Scotia.
- .12 For standard connections, select details from CISC Handbook of Steel Construction to ensure structural adequacy.
- .13 All bolts in lateral bracing connections are to be pretensioned and slip-critical.
- .14 Provide stiffening plates at all HSS connections as required.
- .15 Joists
  - .1 Design joist member connections to safely transmit forces shown.
  - .2 Design and connect joists to furnish lateral support to the chords or flanges of supporting steel members. Anchor joists to such members and at opposite ends by connections capable of withstanding a horizontal force of not less than 2 percent of end reaction of truss.
- .16 Pool Girders and Beams
  - .1 Pre-drill all holes before applying surface paint finish to steel.
  - .2 Any splices to be field bolted. Bolts for splice and splice plates to have same surface preparation and paint finish as the girders and beams.
  - .3 Touch up all connection components as required after erection is complete.

### 1.8 Shop Drawings

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Indicate shop and erection details including cuts, copes, connections, holes, bolts and welds. Indicate welds by welding symbols defined in W59-13.
- .3 Submit description of methods, sequence of erection and type of equipment proposed for use in erecting structural steel. This submission or its approval shall not relieve the Contractor of his responsibility for providing proper methods, equipment, workmanship and safety precautions.
- .4 Affix the seal of the Structural Engineer registered to practise in Nova Scotia who is responsible for connection design and drawing preparation to each shop drawing.
- .5 Do not reproduce the Consultant's drawings in the preparation of shop drawings.

## PART 2 – PRODUCTS

### 2.1 Materials

- .1 Structural steel: to CAN/CSA-G40.21-13, Grade 300W, WWF and W sections to be Grade 350W, HSS sections to be Grade 350W, Class C or Class H.
- .2 Bolts, nuts and washers: to ASTM A325.
- .3 Welding materials: to CSA W48 Series and CSA W59-13.
- .4 Shop paint primer: to CISC/CPMA 2-75 except where noted otherwise in Division 09.
- .5 Painting of Structural Steel: in accordance with Sections 09 91 00, 09 91 01 and 09 96 13.

## Structural Steel

---

- .6 Zinc-Rich Touch-up Paint: Galvaform as supplied by W.R. Meadows Limited or approved alternative.
- .7 Hot dip galvanizing: galvanize steel, where indicated, to CSA G164-M92, minimum zinc coating of 600 g/m<sup>2</sup>.
- .8 Shear stud connectors: to CSA W59-13, ASTM A-108 and ASTM A-496.
- .10 Anchor bolts: to CSA-G40.21, Grade 300W

### 2.2 Shop Painting Standard Structural Steel

- .1 Clean, prepare surfaces and shop prime structural steel to CSA-S16-14 in preparation for CISC/CPMA Standard 2-75 primer except where noted otherwise in Division 09.
- .2 Visual inspection of shop welding shall be carried out prior to shop painting.
- .3 Use primer unadulterated, as prepared by the manufacturer. Do not paint when temperature is below 5c.
- .4 After erection, immediately repair nicks, scratches, and/or surface abrasions, etc. in coatings in accordance with NACE Guidelines and to the product manufacturer's written procedure.

### 2.3 Pool Areas of Exposed Structural Steel

- .1 In accordance with Sections 09 91 01 and 09 96 13.

### 2.4 Exterior Steel

- .1 Exterior structural steel: Hot dip galvanizing: Galvanize all structural steel exposed to weather and other steel as indicated on drawings to CSA-G164. Minimum zinc coating shall be 450 grams per square meter.

## PART 3 – EXECUTION

### 3.1 Fabrication

- .1 Fabricate structural steel as indicated in accordance with CSA-S16-14 and CSA-S136-16 and in accordance with shop drawings.
- .2 Provide wall anchors for wall bearing beams unless otherwise indicated.
- .3 Reinforce openings to maintain required design strength.
- .4 Install shear studs in accordance with CSA W59.
- .5 Unless otherwise noted, provide a 10 mm cap plate at the top of all columns and all HSS members. Continuously seal weld to member.
- .6 Seal all HSS members exposed to weather or in pool area with continuous seal welds.
- .7 Camber steel beams where indicated on structural drawings.

## Structural Steel

---

- .8 Provide holes for attachment of other work where required.
- .9 Where finished surfaces of steel are to be left exposed to view, fabricate to AISC specifications for architecturally exposed steel including straightness. Remove mill marks, identification and surface imperfections.
- .10 Exposed welds to be continuous for length of each joint. Grind exposed welds smooth and flush.
- .11 Pre-drill top flanges of beams and girders to receive bolts for timber decking.

### **3.2 Connection to Existing Work**

- .1 Verify dimensions of existing work before commencing fabrication.

### **3.3 Marking**

- .1 Mark materials in accordance with CAN/CSA-G40.20-13. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

### **3.4 Erection**

- .1 Erect structural steel as indicated in accordance with CSA-S16-14 and CSA-S136-16 and in accordance with shop drawings.
- .2 Continuously seal members by continuous welds where indicated. Grind smooth.
- .3 Obtain written permission of the Consultant prior to field cutting or altering of structural members.
- .4 Touch up shop primer to bolts, welds and burned or scratched surfaces at completion of erection.
- .5 Assume full responsibility for the integrity of structure during erection. Make necessary provision for all erection loads and for sufficient temporary bracing to maintain safe structure, plumb and in true alignment until completion of erection and installation of necessary permanent bracing.
- .6 Set column base plates and loose bearing plates with steel shims to proper elevation, true and level, ready for grouting-in.

### **3.5 Masonry Wall Supports**

- .1 Provide 6 mm diameter x 225 mm long hump rods at 450 mm o.c. on all faces of steel columns which are butting to concrete block partitions.
- .2 Provide angle supports on each side of the top of all block wall partitions to CSA A370 and CSA A371. Maximum spacing to be 1500 on center.

### **3.6 Field Touch-Up Painting**

Structural Steel

---

- .1 Field touch-up painting of areas damaged to bare metal, welds, burns will require a surface preparation equal to SSPC SP11(Power Tool Bare Steel) prior to reinstating the specified coating system.
- .2 Field touch-up painting of areas where only the top coat is damaged, will require a surface preparation equal to SSPC SP2 Hand Tool Cleaned (sanded) prior to applying the top coat in the repair area.
- .3 Field touch-up of bolts will required a solvent cleaning to SSPC SP1 prior to applying 2 coats of the specified top coat at 5-7 mils dft per coat.

**3.7 Coatings Inspection**

- .1 All shop applied high performance coating systems will be inspected by a NACE Certified Coatings Inspector in accordance with Section 09 96 13.
- .2 Provide safe access and working areas for inspection on site, as required by testing agency and as authorized by Consultant.

**3.8 Field Quality Control**

- .1 Inspection and testing of materials and workmanship: in accordance with Section 01 45 00.
- .2 The testing program is to include field review of steel framing in place including review and NDT of welding of structural steel and deck. Follow requirements of CSA W59.
- .3 All welded joints in trusses are to be tested with NDT methods.
- .4 All shop welded splices are to be tested with NDT methods.

**END OF SECTION**

Read and be governed by conditions of the *Contract* and sections of Division 1.

## **PART 1 – GENERAL**

### **1.1 Work Included**

- .1 This section of the Specifications complements the drawings in describing services, labour and materials necessary to complete supply, fabrication and erection of structural steel joists necessary to complete the work summarized as but not necessarily limited to:
  - .1 Roofs

### **1.2 Related Work**

- .1 Structural Steel Section 05 12 00
- .2 Steel Decking Section 05 31 00
- .3 Paint and Steel Preparation for Paint Systems Section 09 91 00
- .4 Paint Systems and Anti-Corrosion Schedule Section 09 91 01
- .5 Paint and Steel Preparation for High Performance Paint Systems Section 09 96 13

### **1.3 Reference Standards**

- .1 Do work in accordance with CAN/CSA-S16-14 and CSA-S136-16, except where specified otherwise.
- .2 Do welding in accordance with CSA W59-13, except where specified otherwise.
- .3 Use qualified fabricators in accordance with CSA W47.1-92.

### **1.4 Design of Steel Joints**

- .1 Design steel joists to carry loads indicated on drawings in accordance with CSA-S16-14 and CSA-S136-16.
- .2 Camber joists to requirements of CSA-S16-14 or unless noted otherwise on drawings, camber joists for deflection under dead load whichever produces the greater camber value.
- .3 Deflection of joists under live load shall not exceed  $1/240^{\text{th}}$  of span or  $1/360^{\text{th}}$  of span when plaster or gypsum board ceilings are hung from joists, unless noted otherwise on drawings.

### **1.5 Shop Drawings**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Each drawing submitted shall bear the signature and stamp of a qualified professional engineer registered in province of Nova Scotia who is responsible for joist design and shop drawing preparation.
- .3 Indicate joist spacing, bearing and anchorage details, framed openings, accessories, schedule of materials, depth, camber and loadings.

## **PART 2 – PRODUCTS**

### **2.1 Materials**

- .1 Structural steel: to CAN/CSA-G40.21-13.
- .2 Welding materials: to CSA W59-13.
- .3 Shop paint primer: to CISC/CPMA 2-75 unless noted otherwise.

### **2.2 Fabrication**

- .1 Fabricate steel joists and accessories in accordance with CSA-S16-14 and CSA-S136-16.
- .2 Weld in accordance with CSA W59-13.
- .3 Provide top and bottom chord extensions where indicated.
- .4 Seal welds area not required for any steel joists.

### **2.3 Shop Painting**

- .1 All exposed steel to be shop primed to CISC/CPMA 2-75 unless noted otherwise. See Structural Steel Specification Section for notes on Surface Preparation and Painting.

## **PART 3 – EXECUTION**

### **3.1 Erection**

- .1 Erect steel joists and bridging as indicated in accordance with CSA-S16-14 and CSA-S136-16 and in accordance with shop drawings.
- .2 Obtain written permission of the Consultant prior to field cutting or altering joists or bridging.
- .3 Touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

### **3.2 Field Quality Control**

- .1 Inspection and testing of materials and workmanship: in accordance with Section 01 45 00.
- .2 Inspect steel joists to requirements of CSA W59. Visually inspect a minimum of 50% of joist welds.

**END OF SECTION**

Steel Deck

---

Read and be governed by conditions of the *Contract* and sections of Division 1.

## **PART 1 – GENERAL**

### **1.1 Work Included**

- .1 This section of the Specifications complements the drawings in describing services, labour and materials necessary to complete supply, fabrication and erection of steel decking necessary to complete the work summarized as but not necessarily limited to:

- .1 Roofs

### **1.2 Related Work**

- .1 Structural Steel Section 05 12 00
- .2 Steel Joists Section 05 21 00
- .3 Paint and Steel Preparation for Paint Systems Section 09 91 00
- .4 Paint Systems and Anti-Corrosion Schedule Section 09 91 01
- .5 Paint and Steel Preparation for High Performance Paint Systems Section 09 96 13

### **1.3 Reference Standards**

- .1 Do design, fabrication and erection in accordance with CSA-S136-16.
- .2 Do steel decking work in accordance with Canadian Sheet Steel Building Institute Standards for Steel Roof Deck and Steel Floor Deck, latest revisions, except where specified otherwise, CSSBI 10M.
- .3 Do welding in accordance with CSA W59-13, except where specified otherwise.

### **1.4 Design Criteria**

- .1 Calculate structural design of steel decking by limit states design.
- .2 Steel decking shall safely carry dead, live and diaphragm loads as indicated.
- .3 Deflection under live load only shall not exceed  $1/240^{\text{th}}$  of span, except that when plaster or gypsum board ceilings are hung directly from decking, live load deflection shall not exceed  $1/360^{\text{th}}$  of span.

### **1.5 Shop Drawings**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Each drawing submitted shall bear the signature and stamp of an Engineer licensed to practice in Nova Scotia who is responsible for the steel deck design and shop drawing preparation.
- .3 Clearly indicate decking plan, profile, dimensions, core thickness, connections to supports and spacings, projections, openings, and reinforcement details and accessories.

Steel Deck

---

## PART 2 – PRODUCTS

### 2.1 Materials

- .1 Sheet steel: to ASTM A653M, galvanized, with Z 275, G90, zinc coating, Grade A structural quality. Where deck is to receive paint, refer to Sections 09 91 00 and 09 96 13.
- .2 Cover plates, cell closures and flashings: galvanized steel sheet with minimum steel core thickness of 0.76 mm.
- .3 Closures to external walls: neoprene or as recommended by manufacturer.
- .4 Primer: zinc rich, ready mix to CGSB 1-GP-181M+Amdt-Mar-78.Fabrication

### 2.2 Types of Decking

- .1 Roof deck: 0.76 mm core thickness or as indicated on drawings, 38 mm deep profile, interlocking side laps.

## PART 3 – EXECUTION

### 3.1 Erection

- .1 Design, detail, fabricated and erect in accordance with CSA S136 and CSSBI 10M.
- .2 Do welding in accordance with CSA W59.
- .3 Erect steel deck in accordance with CSA S136 and CSSBI 10M, except as specified otherwise.
- .4 Butt ends: 1.5 mm to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.
- .5 Lap ends 50 mm minimum.
- .6 After deck is permanently secured in place, immediately touch up metallic coated top surface with compatible primer where burned by welding.

### 3.2 Closures

- .1 Where metal decking rests on exterior masonry walls, fill web spaces with neoprene closures or as recommended by manufacturer.
- .2 Where flutes are at right angles to exterior walls, and decking extends beyond these walls, caulk interlocking side laps of decking for 410 mm immediately over walls. Install interior and exterior closures. Caulk exterior closures to prevent air infiltration. Caulk interior closures to prevent water vapour exfiltration. In addition, provide roofer with sufficient quantity of glass fibre pads to close off topside flutes directly over face of wall or use closures as recommended by manufacturer.
- .3 Where flutes run at right angles to interior partitions, fill web spaces with double run of acoustical closures or as recommended by manufacturer.
- .4 Where flutes are parallel to interior partitions, install steel closure flashings to provide neat juncture between two materials or as recommended by manufacturer.

### **3.3 Openings and Areas of Concentrated Loads**

- .1 Framing of deck openings 150 mm to 310 mm shall be as recommended by manufacturer except as otherwise indicated. No reinforcement required for openings cut in deck which are smaller than 150 mm square.
- .2 For deck openings over 310 mm square and for areas of concentrated load, reinforce in accordance with structural framing details.

**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 Metal cladding.
    - .2 Soffit cladding.

### **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 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.

### **1.4 Quality Assurance**

- .1 Qualifications:

Lateral Load-Bearing Cold-Formed Metal Framing

---

- .1 Execute work only by a *Subcontractor* who has adequate 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 Aspects of the work of this section related to structural design are required to be prepared by a professional engineer. Refer to Section 01 33 00 for specific details and requirements in this regard.
- .2 Mock-up:
  - .1 Prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with *Project* requirements. Install mock-up at location directed by *Consultant*, separate to the work. Retain accepted mock-up as quality standard for acceptance of completed work. *Provide* mock-up of sufficient size and scope to show construction and workmanship for work.

## 1.5 Delivery, Storage, and Handling

- .1 *Products* shall be protected from conditions that may cause physical damage or corrosion.

## PART 2 - PRODUCTS

### 2.1 Performance/Design Requirements

- .1 Design shall be based on limit states design principles using factored loads and resistances.
- .2 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.
- .3 Resistances and resistance factors shall be in accordance with the building code and CAN/CSA S136-07.
- .4 Conform to the requirements of fire rated assemblies which have been tested in accordance with CAN/ULC S101-07 and provide indicated fire resistance rating.
- .5 Adjust metal framing material thicknesses and spacing, as required by the design criteria.
- .6 Space framing members in accordance with design criteria and at maximum spacing of 400 mm (16").
- .7 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.
- .8 Design anchorage and splice details for bridging.
- .9 Design for local loading due to anchorage of cladding and interior wall mounted fixtures.
- .10 Maximum flexural deflections under specified lateral loads shall conform to following:
  - .1 L/360 unless otherwise indicated.
  - .2 Metal framing assemblies supporting non-metal finished soffits: L/720.

Lateral Load-Bearing Cold-Formed Metal Framing

---

- .11 Design components or assemblies to accommodate specified erection tolerances of the structure.
- .12 Provide head, sill and jamb members and connections to frame openings larger than 100 mm (3-15/16") in any dimension.
- .13 Limit free play and movement in connections perpendicular to the plane of the framing to  $\pm 0.5$  mm (0.019") relative to the building structure.
- .14 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.
- .15 Allow for movement of structure. Design end connections to accommodate floor/roof deflections such that framing is not loaded axially.
- .16 Connections between lightweight steel framing members shall be by bolts or sheet metal screws.
- .17 Resistances for sheet metal screws shall be based on manufacturer's lowest bound test values multiplied by appropriate resistance factor, given in CAN/CSA S136-07.
- .18 Coordinate framing and provide support for control joints specified in Section 09 29 00.
- .19 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.
- .20 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 shall conform to requirements of CAN/CSA S136-07 and shall 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-16ae1. Other coatings providing equal or better corrosion protection may be used, subject to acceptance of *Consultant*.

Lateral Load-Bearing Cold-Formed Metal Framing

---

- .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 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.
- .6 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 Lateral load-bearing metal framing shall be erected true and plumb within specified tolerances. Temporary bracing shall be employed wherever necessary to withstand loads to which the structure may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long as required for safety and integrity of structure. Erector shall ensure that during erection a margin of safety consistent with the requirements of the building code and CAN/CSA S136-07.
- .2 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 Align adjacent prefabricated panels to provide surface continuity at interface.
  - .6 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

---

- .3 Make field measurements necessary to ensure proper fit of members.
- .4 Cutting of members may be by saw or shear. Torch cutting is not permitted.
- .5 Holes that are field cut into lightweight steel framing members shall conform to requirements of Paragraph 2.3.1.

**END OF SECTION**

Metal Fabrications

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Work of this section includes metal fabrications and related metals including, but not limited to, the following:
  - .2 Work of this section includes, but is not limited to metal fabrications and related metals as set out in Section 05 50 01 Miscellaneous Metals Fabrication Schedule.

### **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 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 Submit engineered shop drawings.
  - .2 Include plans, sections and large scale details, and shall 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.
  - .3 Indicate proposed site connections and methods.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors: work of this section shall be executed only by a *Subcontractor* who has adequate plant, equipment, and skilled tradespersons to perform work expeditiously, and is known to have been responsible for satisfactory installations similar to that required in the *Work* during a period of at least the immediate past 5 years.
  - .2 Aspects of the work of this section are required to be prepared by a professional engineer. Refer to Section 01 33 00 for specific details and requirements in this regard.
- .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.
- .3 Mock-ups:
  - .1 Provide mock-ups in accordance with Section 05 50 01 Metal Fabrications Schedule.

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 all other governing authorities.
- .2 Welding:
  - .1 Weld structural components in steel to conform to requirements of CSA W59-13, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-09(R2014) and CSA W55.3-08 (R2013) as applicable.
  - .2 Weld components in aluminum to conform to requirements of CSA W59.2-M1991 (R2013), and by a fabricator certified by the Canadian Welding Bureau to conditions of CSA W47.2-11(R2015).
  - .3 Weld stainless steel components to conform to requirements of CSA W59-13 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 W47.1-09(R2014).
- .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:
    - .1 3.2 mm (1/8") in 3 m (10'-0")
  - .2 Maximum variation from level:
    - .1 3.2 mm (1/8") in 9 m (30'-0").
  - .3 Maximum variation from straight:
    - .1 3.2 mm (1/8") in 3 m (10'-0") under a 3 m (10'-0") straight edge.
  - .4 Maximum variation from angle indicated:
    - .1 10 seconds.
  - .5 Tolerances shall be non-cumulative.

### 2.2 Materials

- .1 General:
  - .1 Unless detailed or specified otherwise, standard *Products* will be acceptable if construction details and installation meet intent of the *Contract Documents*.

### Metal Fabrications

---

- .2 Include materials, *Products*, accessories, and supplementary parts necessary to complete assembly and installation of work of this section.
- .3 Incorporate only metals that are free from defects that are visible, or that impair strength or durability. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharply defined profiles.
- .4 The engineer responsible for the production of the shop drawings is responsible for structural design, member sizes, arrangement, connections and anchoring of work of this section. Coordinate and maintain materials, dimensions, layout and appearance to meet intent of the *Contract Documents*.

#### .2 Metals:

- .1 Steel, structural shapes, plate, bars: hot-rolled, CSA G40.21-04, Grade 300W.
- .2 Steel, hollow structural sections: hot-formed, seamless, CSA G40.21-04, Grade 350W, Class H.
- .3 Steel (mild), sheet and strip, hot rolled, ASTM A1011/A1011M-10.
- .4 Steel, sheet: cold rolled, stretcher levelled, fully pickled, ASTM A1008/A1008M-11, Grade CS Type A exposed, matte finish, dry, unless otherwise indicated.
- .5 Steel pipe: ASTM A53/A53M-10, Type E or S, Grade A or B, standard weight, Schedule 40 seamless black or AISI MT 1010/1015, or acceptable alternative.
- .6 Stainless steel materials; Type 304 unless otherwise indicated:
  - .1 Stainless steel tubing: to ASTM A269, Commercial Grade, seamless welded.
  - .2 Stainless steel sheet and plate: ASTM A167-99(2009).
  - .3 Stainless steel bar and angle: ASTM A276/A276M-16a.
  - .4 Stainless steel seamless pipe: ASTM A312/A312M-16a.
- .7 Aluminum materials:
  - .1 Aluminum extrusions: Alloy 6063-T5 or T6 to ANSI H35.1/H35.1M-2013.
  - .2 Aluminum sheet: aluminum alloy 5005H14 to ANSI H35.1/H35.1M-2013. Exposed sheet shall be machine flattened free of distortions, resquared sawcut edges.

### 2.3 Accessories

#### .1 Fasteners:

- .1 Fasteners: Exposed fasteners to match the material surface on which they occur.
- .2 Fasteners for stainless steel to be stainless steel 300 Series or stainless steel 400 Series.
- .3 Fasteners in contact with aluminum to be stainless steel 300 Series, stainless steel 400 Series, cadmium plated or aluminum.
- .4 Bolts and anchor bolts: to ASTM A307-14.
- .5 High strength bolts: to ASTM A325-14.

Metal Fabrications

---

- .6 Use embedded epoxy set anchors for anchorage to concrete at exterior locations exposed to weather, unless otherwise indicated; installation and embedment depth shall be as per manufacturer's instructions, embedment depth shall not be greater than 80% of concrete thickness.
- .7 Other types of fasteners as appropriate to meet design requirements.
- .2 Welding materials:
  - .1 Steel: to CSA W59-13.
  - .2 Aluminum: to CSA W59.2-M1991 (R2013).
  - .3 Stainless steel: ANSI/AWS D1.6/D1.6M-2007.
- .3 Grout:
  - .1 Epoxy grout; non-shrink, non-expanding:
    - .1 Hilti 'HY-150'.
    - .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-14a:
    - .1 Sika 'Sika Grout 212' or 'Sika M-Bed Standard'.
    - .2 W.R. Meadows 'Sealtight CG-86 Construction Grout'.
- .4 Dielectric separator: Best grade, quick drying non-staining alkali resistant bituminous paint to CAN/CGSB 1.108-M89, or membrane type to acceptance of *Consultant*.

## 2.4 Finishes

- .1 Shop primers;
  - .1 Service grade (unless otherwise indicated or scheduled):
    - .1 CISC/CPMA 2-75 or SSPC-Paint 20, Paint Specification No. 20: Zinc-Rich Primers (Type I "Inorganic" and Type II "Organic").
  - .2 Premium grade: Acrylic DTM Rust Inhibitive Primer.
    - .1 Acceptable *Products* as recommended by top coat manufacturer:
      - .1 Sherwin Williams B66W1 or B66W310 DTM Primer.
      - .2 PPG Pitt-Tech 90-712 or 90-912 Series DTM Primer.
      - .3 Substitutions: in accordance with Section 01 25 00.
- .2 Shop primer; galvanized steel in pool or arena environments: in accordance with Section 09 96 13.
- .3 Organic zinc-rich coating; for touching up welds and damaged metallic coatings:
  - .1 Organic Zinc-Rich coating containing 95% metallic zinc, by weight in the dried film; recognized under the Component Program of Underwriter's Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to Federal Specification DOD-P-21035A for repair of hot-dip galvanizing.
  - .2 Basis of design: ZRC Cold Galvanizing Compound.

## Metal Fabrications

---

- .4 Hot dip galvanizing: for irregular sections, conforming to CAN/CSA G164-M92, minimum zinc coating of 600 g/m<sup>2</sup>. Use air cooling method (no water or chromate dipping treatment permitted).
- .5 Stainless steel: AISI No. 4 brushed finish.
- .6 Aluminum: Clear anodized to AAMA 611-14, designation AA-M10C22A31.

### 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 anchors at 610 mm (24") on centre or as otherwise required for secure attachment for metal fabrications located in cast-in-place concrete and concrete masonry units.
  - .4 Incorporate means for fastenings of other work secured to work of this section.
  - .5 Do welding work in accordance with CSA W59-13 and CSA W59.2, ANSI/AWS D1.6/D1.6M-2007 as applicable, unless specified otherwise.
- .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 Ensure that metal fabrications will 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.
- .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.
  - .3 Allow for differential movements within assemblies and at junctions of assemblies with surrounding *Work*.
  - .4 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 reviewed shop drawings.
  - .5 Incorporate holes and connections for work installed under other sections.
  - .6 Cleanly and smoothly finish exposed edges of materials including holes.
  - .7 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work.

Metal Fabrications

---

- .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 instructions.
  - .3 Apply primer in accordance with paint manufacturer's installation instructions.
- .5 Shop prime painting; galvanized steel in pool or arena environments: in accordance with Section 09 96 13.
- .6 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-SP1-82(R2004), rust scale to SSPC-SP3-82 (R2004), 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 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 ensure that metal fabrications are fabricated to 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 Attach metal fabrications to interior concrete and masonry with corrosion resistant expansion bolts to support load with a safety factor of 3.
- .4 Attach metal fabrications to exterior concrete and masonry with non-shrink epoxy cement to support load with a safety factor of 3.
- .5 Insulate between dissimilar metals or between metal, and masonry or concrete with bituminous paint to prevent electrolytic action.
- .6 Where indicated, grout metal posts, pickets, balusters, and the like, in metal sleeves cast into concrete, with non-shrink quick setting epoxy anchor cement, unless detailed otherwise. Fabricate sleeves of 75 mm (3") minimum in depth.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

Metal Fabrications

---

**3.3 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 Clean and repair areas of bare metal and welds on galvanized surfaces with zinc rich paint. Welded area of members to be masked to minimize overpainting of adjacent undamaged surfaces. Prepare substrate to remove oil and grease to SSPC-SP1-82(R2004), rust scale to SSPC-SP3-82 (R2004), mill scale to SSPC-SP6.
- .3 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.

**3.4 Protection**

- .1 Protect finished surfaces from damage from time of installation until final finishes are applied or to final cleanup.

**END OF SECTION**

Miscellaneous Metals Fabrication Schedule

---

## **PART 1 – GENERAL**

### **1.1 General Notes**

- .1 Read in conjunction with Section 05 50 00

### **1.2 Scope**

- .1 Work of this section consists of metal fabrications and related metals including, but not limited to the items scheduled below.
- .2 Work of this section includes items indicated as miscellaneous (MISC) metal or steel.

### **1.3 Materials and Finishes**

- .1 Shop applied finishes in accordance with Section 05 50 00 and Section 05 50 10.
- .2 Field applied finishes in accordance with Section 09 91 00.
- .3 Exposed items include those items visible from floor level, such as bench supports and under counter brackets.

### **1.4 Materials and Finishes Legend**

<b>Abbreviation</b>	<b>Reference</b>
ALUM	Aluminum
GALV	Galvanized
PREFIN	Prefinished
SST	Stainless Steel
Shop – ZINC	Shop applied service grade, Zinc-Rich Primer
Shop – DTM	Shop applied premium grade, Acrylic DTM Rust Inhibitive Primer
Shop - Powder	Shop applied powder painting.
Field – DTM	Field applied Acrylic DTM Primer
Field – WB Epoxy	Field applied W.B. Light Industrial coating
Field – HIPAC	Field applied High Performance Architectural Latex
Field – HP Acrylic	Field applied High Performance Acrylic
Concealed	Concealed from view in the finished building
Exposed	Exposed to view in the finished building

Miscellaneous Metals Fabrication Schedule

**1.5 Schedule**

Item	Description	Materials	Applied Finish: Shop or Field applied as indicated		Notes
			Primer	Top Coat	
<b>1.0</b>	<b>EXTERIOR</b>				
<b>1.1</b>	<b>Mechanical Equipment Enclosure</b>				
	Framing	Steel - GALV	Not required	Not required	
	Cladding at Screen & Doors	Aluminum - PREFIN	Not required	Not required	Mock up required.
<b>1.2</b>	<b>Exterior Basement Access Stair</b>				
	Stairs, landings and platforms	Steel - GALV	Not required	Not required	Steel grating.
	Rails	Steel - GALV	Not required	Not required	
	Cladding at Guard & Gate	Aluminum - PREFIN	Not required	Not required	Mock up required.
<b>1.5</b>	<b>Bollards</b>	Steel - GALV	Field - DTM	Field – HP Acrylic	At service area
<b>1.6</b>	<b>Loose steel lintels</b>	Steel - GALV	Field - DTM	Field – HP Acrylic	
<b>2.0</b>	<b>INTERIOR</b>				
<b>2.1</b>	<b>Exit Stairs and Utility Stairs</b>				
	Stairs, landings and platforms	Steel	Shop - Zinc	Field - WB Epoxy	Concrete filled steel pan stair tread and landings.
	Rails, guards and balustrades	Steel	Shop - Zinc	Field - WB Epoxy	
<b>2.2</b>	<b>Pipe rails not indicated above</b>	Steel	Shop - Zinc	Field - WB Epoxy	
<b>2.3</b>	<b>Loose steel lintels – interior</b>	Steel	Shop - DTM	Field - WB Epoxy	
<b>2.4</b>	<b>Metals required to support glazed screens, partitions and entryways</b>				
	Concealed items	Steel	Shop - DTM	Not required	
	Exposed items	Steel	Shop - DTM	Field - WB Epoxy	
<b>2.5</b>	<b>Metals required to support coiling metal doors, shutters and grilles</b>				
	Concealed items	Steel	Shop - DTM	Not required	

Miscellaneous Metals Fabrication Schedule

Item	Description	Materials	Applied Finish: Shop or Field applied as indicated		Notes
			Primer	Top Coat	
	Exposed items – light duty	Steel	Shop - DTM	Field - WB Epoxy	
<b>2.6</b>	<b>Metals required to support operable partition</b>				
	Concealed items	Steel	Shop - DTM	Not required	
	Exposed items	Steel	Shop - DTM	Field - WB Epoxy	
<b>2.7</b>	<b>Metals required to support ceiling hung washroom and shower partitions</b>				
	Concealed items	Steel - GALV	Not required	Not required	
	Exposed items	Steel	Shop - DTM	Field - WB Epoxy	
<b>2.8</b>	<b>Metals required to support bulkheads over lockers</b>				
	Concealed items	Steel - GALV	Not required	Not required	
<b>2.9</b>	<b>Metals required to support lifting device in Universal WC / Shower</b>				
	Concealed items	Steel - GALV	Not required	Not required	
<b>2.10</b>	<b>Lateral masonry support angles</b>				
	Concealed items	Steel - GALV	Not required	Not required	
	Exposed items	Steel - GALV	Field - DTM	Field - WB Epoxy	
<b>2.11</b>	<b>Sump pit covers and hatch</b>	Steel - GALV	Not required	Not required	
<b>3.0</b>	<b>INTERIOR STAIR AT WATERSLIDE</b>				
<b>3.1</b>	Posts, balustrade, cover panels	ALUM	Shop - Powder	Not required	Mock up required.
	Rails support brackets	ALUM	Shop - Powder	Not required	
<b>4.0</b>	<b>INTERIOR MILLWORK</b>				
<b>4.1</b>	<b>Metal support framing for vanities, benches, change tables and grooming counters</b>				

Miscellaneous Metals Fabrication Schedule

Item	Description	Materials	Applied Finish: Shop or Field applied as indicated		Notes
			Primer	Top Coat	
	Concealed items	Steel - GALV	Not required	Not required	
	Exposed items	Steel - GALV	Field - DTM	Field - WB Epoxy	
<b>4.2</b>	<b>Metal support framing for service counters and reception desks</b>				
	Concealed items	Steel	Shop - DTM	Not required	
	Exposed items	Steel	Shop - DTM	Field - WB Epoxy	

**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 grounds, nailers, blocking and sleepers.
    - .3 Wood roof blocking.

### **1.2 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Shop drawings:
  - .1 Clearly indicate details of construction, profiles, jointing, fastening and other related details.

### **1.3 Quality Assurance**

### **1.4 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-2010 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-2010.
  - .3 Dimension lumber species and grades:
    - .1 Spruce-Pine-Fir.
    - .2 Light framing to NLGA-2010 Construction grade, S-Dry.
    - .3 Planks to NLGA-2010 No. 2 grade, S-Dry.
    - .4 Boards to NLGA-2010 No. 4 Common grade, S-Dry.

## Rough Carpentry

---

- .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 Wood preservative pressure treatment:
  - .1 Wood shall be pressure treated with wood preservative treatment to CAN/CSA O80. Treat end cuts with compatible end cut preservative.
- .2 Fire retardant pressure treatment:
  - .1 Wood shall be pressure impregnated with fire-retardant chemicals to CAN/CSA O80 and have flame-spread rating of not more than 25 to CAN/ULC-S102-10 after wood has been subjected to an accelerated weathering test as specified in ASTM D2898-07 for exterior applications.

### 2.3 Panel Materials

- .1 Softwood plywood (CSP): to CSA O151-09.
- .2 Douglas Fir plywood (DFP): to CSA O121-08.

### 2.4 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-15, conducted by a qualified independent testing and inspecting agency.
  - .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.
    - .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: ASTM A153/A153M-09 Class A or B1 G185 (CAN/CSA G164-M92 minimum zinc coating of 600 g/m<sup>2</sup>) and connectors meeting ASTM A653/A653M-11 Class G-185 sheet (CAN/CSA G164-M92 minimum zinc coating of 600 g/m<sup>2</sup>) or better.

## Rough Carpentry

---

### .5 Hardware materials:

- .1 Hot-dipped galvanized to CAN/CSA G164-M92 with minimum zinc coating of 600 g/m<sup>2</sup> or hot-dipped galvanized fasteners complying with ASTM A153/A153M-09, Class A or B1, and connectors complying with ASTM A653/A653M-11, Class G185.

## 2.5 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 carefully and 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 Cooperate with work of other sections to ensure that unity of actions will ensure orderly progress to meet construction schedule.
- .4 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.
- .5 Do not attach work by wood plugs or blocking in concrete or masonry.
- .6 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.
- .7 Cut work into lengths as long as practical and with square ends. Erect work plumb, in true planes, and fastened rigidly in place.
- .8 Verify that grounds required for fastening of components and equipment are located correctly, and sized for adequate support.

### 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:

Rough Carpentry

---

- .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 instructions.
- .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 *Provide* backboards for mounting equipment as required. Use 19 mm (3/4") Softwood Plywood.
- .2 Refer to Divisions 21, 22, and 23 and Divisions 26, 27, and 28 for requirements for electrical backboards.

### **3.4 Miscellaneous Plywood Blocking**

- .1 *Provide* minimum 19 mm (3/4") softwood plywood blocking for attachment of miscellaneous fitments as indicated.
- .2 Wood blocking within gypsum board metal stud assemblies under work of Section 09 22 00.

**END OF SECTION**

- .1 Design deck in accordance with requirements of the NBCC 2015 to safely support loadings shown or implied.
- .2 Design deck such that the live load deflection of the deck shall not exceed  $1/360$  of the span.
- .3 Design deck anchorage to the supporting framework or walls to safely resist net uplift forces shown, but not less than 0.50 kPa.
- .4 Design deck for horizontal shear loads as shown on the shear force diaphragm.
- .5 Wherever possible, design units to span over three or more supports in order to obtain increased rigidity.

Nail Laminated Timber

---

## **1.4 Submittals**

- .1 Shop Drawings
  - .1 Submit shop drawings in accordance with Section 01 33 00.
  - .2 Clearly indicate stress grade, service grade, shop and erection details, temporary intermediate supports of composite NLT panels, panel orientation, including cuts, holes, fastenings and connection hardware and camber.
  - .3 If requested by the Consultant, submit connection design calculations, stamped by the Engineer responsible for the design.
  - .4 Each shop drawing submitted shall bear stamp of a qualified Professional Engineer registered in the Province of Nova Scotia.
- .2 Calculations
  - .1 Submit sketches and calculations bearing the stamp and signature of a Professional Engineer licensed in the Province of Nova Scotia as may be necessary to show design and loading assumptions including, but not limited to, all connection designs and details including hardware, appearance and member net section design.
- .3 As-Built Drawings
  - .1 Mark on 1 complete sets of final drawings any changes, additions or deletions that occur during the construction as a result of the Contractor's work, change orders or for any other reason.

## **1.5 DELIVERY AND HANDLING**

- .1 Arrange delivery of members and/or panels in accordance with construction schedule to designated delivery location.
- .2 Affix authorized label to all NLT panels supplied. Identify each panel with mark number.
- .3 Use padded, non-marring slings for handling members.
- .4 Protect corners with wood blocking.
- .5 Slit underside of membrane covering during storage at site.
- .6 Store nail-laminated timber well blocked off ground and separated with stripping, so air may circulate around all four sides of members.
- .7 Cover top and sides with opaque moisture resistant membrane if unprotected.

## **1.6 PROTECTION**

- .1 Maintain protection of nail laminated members until protected by building membrane/finishes, etc.
- .2 Bolts, nuts, washers, timber rivets, split rings, shear plates and all other connectors are to be hot-dip galvanized.

## **PART 2 - PRODUCTS**

### **2.1 NLT Supply/Fabrication**

- .1 The NLT supplier/fabricator carried by the General Contractor shall be named in the bid submission, and shall not be changed following award of contract unless approved by the Consultant on behalf of the Owner.

### **2.2 Materials**

- .1 NLT Panels
  - .1 Laminating stock: Sustainably harvested Spruce-Pine-Fir to CAN/CSA O122. Refer to section 3 for stress grade, appearance grade etc.
  - .2 Steel for connections: to CSA Standard G40.21M Grade 300W.
  - .3 Bolts, nuts and washers: ASTM A307, galvanized.
  - .4 Galvanizing: to CAN/CSA G164-M92 hot dipped, minimum zinc coating of 600 g/m<sup>2</sup>.
  - .5 Coatings:
    - .1 Two coats "Sansin SDF" plus one coat of "Sansin Top Coat" as distributed by the Sansin Corporation, Strathroy, Ontario, or equivalent. Coordinate with Section 09 91 00.

## **PART 3 – EXECUTION**

### **3.1 Fabrication**

- .1 Fabricate members to the following classifications:
  - .1 Appearance grade:
    - .1 NLT: Architectural.
- .2 NLT Panels: Fabricate NLT panels in accordance with CAN/CSA O122 and to the following classifications:
  - .1 Stress grade: SPF No.1 or 2
  - .2 Mark NLT panels for identification during erection so that marks will be concealed in final assembly. Clearly mark top surface of all floor and roof panels.
  - .3 Custom NLT panels meeting the minimum requirements outlined in this specification and on the structural drawings may be acceptable subject to the approval of the consultant.
- .3 Connections:
  - .1 Types of connections are shown.
  - .2 Connections are to be designed by a Professional Engineer registered in the Province of Nova Scotia, in accordance with CSA Standard O86 and CSA S16.
  - .3 If requested by the Consultant, submit calculations, stamped by the Engineer responsible for the design.
- .4 Cut openings as required for pipes, ducts and the like in accordance with the following:
  - .1 Indicate openings on the fabrication and erections drawings

Nail Laminated Timber

---

- .2 Holes in NLT floor:
  - .1 Holes must be coordinated with NLT manufacturer.
- .3 Do not overcut corners on square openings.
- .4 Holes not conforming to the above shall be approved by the Consultant prior to cutting.

### **3.2 Erection**

- .1 Erect NLT panels level, plumb to correct positions indicated in accordance with CSA Standard O86.
- .2 Brace and anchor materials until permanently fixed.
- .3 Make adequate provisions for erection stresses.
- .4 Make splicing and jointing only in locations shown.
- .5 Fit members closely and accurately to other members and other assemblies.
- .6 Conform to erection tolerances specified in CAN/CSA-S16 Clause 29.3
- .7 Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.
- .8 Field cutting and alteration of members not permitted without Engineer's approval.
- .9 Avoid rapid changes in temperature and humidity when commissioning building HVAC system. Gradually increase heat in the building. Do not direct any forced air heating systems onto NLT panels.

**END OF SECTION**

Read and be governed by conditions of the *Contract* and sections of Division 1.

## **PART 1 - GENERAL**

### **1.1 Related Work**

- |    |                  |                  |
|----|------------------|------------------|
| .1 | Structural Steel | Section 05 12 00 |
| .2 | Rough Carpentry  | Section 06 10 53 |

### **1.2 References**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A36/A36M-08, Standard Specification for Carbon Structural Steel.
  - .2 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - .3 ASTM A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian Standards Association (CSA)/CSA International
  - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
  - .2 CSA G40.20-04/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
  - .3 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .4 CSA O86-14, Engineering design in wood.
  - .5 CSA O112.9-10, Evaluation of adhesives for structural wood products (exterior exposure).
  - .6 CSA O112.10-08, Evaluation of adhesives for structural wood products (limited moisture exposure).
  - .7 CSA S16-14, Design of steel structures.
  - .8 CSA W47.1-09, Certification of companies for fusion welding of steel.
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

### **1.3 Action and Information 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 glued-laminated and/or cross-laminated constructions and

Cross-Laminated Construction

---

- include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit WHMIS MSDS in accordance with Section 01 35 29.06 – Health and Safety Requirements.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia.
  - .2 Submit erection drawings in accordance with CSA S16 and CSA O86.
  - .3 Shop drawings for members: indicate stress grade, service grade and appearance grades, shop applied finishes, camber, cuts, ledgers, holes and connection details.
- .4 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Test and Evaluation Reports: submit certified test reports from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
- .7 Low-Emitting Materials:
  - .1 Submit listing of adhesives and sealants used in building, showing compliance with VOC and chemical component limits or restrictions requirements.
  - .2 Submit listing of glued-laminated and/or cross-laminated products used in building, stating that they contain no added urea-formaldehyde resins.

#### 1.4 Quality Assurance

- .1 Qualifications :
  - .1 Manufacture structural glued-laminated and/or cross-laminated members in plant certified as meeting requirements by a certification agency accredited by the Standards Council of Canada.
  - .2 Submit the material evaluation report listed in the *Registry of Product Evaluations* published by the Canadian Construction Material Centre (CCMC) and/or the product report published by a certification agency accredited by the Standards Council of Canada at completion of fabrication.
  - .3 Fabricator for welded steel connections to be certified to CSA W47.1.
  - .4 Place, on members, the material evaluation report number listed in the *Registry of Product Evaluations* published by the Canadian Construction Material Centre (CCMC) or the product report number published by a certification agency accredited by the Standards Council of Canada, indicating manufactured in certified plant.

- .5 Certification of material protective sealer.

## **1.5 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 materials to site in original factory packaging, labeled with manufacturer's name and address.
  - .2 Apply protective sealer to glued-laminated and/or cross-laminated units before shipping unless specified otherwise.
  - .3 Wrap architectural grade members prior to leaving plant with a moisture resistant wrapping.
  - .4 Use padded, non-marring slings for handling or cross-laminated members.
  - .5 Protect corners with wood blocking.
  - .6 Make adequate provision for delivery and handling stresses.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Slit underside of membrane covering during storage at site without defacing member.
  - .3 Store units and protect from weather, block off ground and separate with stripping, so air may circulate around faces of members.
  - .4 Cover units with opaque moisture resistant membrane if stored outside.
  - .5 Store and protect products from nicks, scratches, and blemishes.
  - .6 Replace defective or damaged materials with new, unless written approval by the manufacturer.

## **PART 2 - PRODUCTS**

### **2.1. Materials**

- .1 Laminating stock:
  - .1 Cross-laminated: Spruce-Pine-Fir FSC Certified, to the product report published by a certification agency accredited by the Standards Council of Canada.
- .2 Adhesive: to CSA O112.9 or CSA O112.10, to grade of service.
  - .1 Urea-formaldehyde free.
- .3 Sealer for glued-laminated and/or cross-laminated members: penetrating type, clear, non-yellowing liquid. Coordinate with Section 09 91 00.

Cross-Laminated Construction

---

- .4 Coatings:
  - .1 Two coats "Sansin SDF" plus on coat of "Sansin Top Coat" as distributed by the Sansin Corporation, Strathroy, Ontario, or equivalent. Coordinate with Section 09 91 00.
- .5 Fastenings:
  - .1 All are to be hot dipped galvanized.
  - .2 Shear plate connectors:
    - .1 Pressed steel type: hot rolled carbon steel, SAE 1010, in accordance with SAE Handbook.
    - .2 Malleable iron type: to ASTM A47/A47M, grade [350].
  - .3 Lag screws: to ASME B18.2.1.
  - .4 Bolts: to ASTM A307.
  - .5 Side plates: to CSA G40.20/G40.21 or ASTM A36.
  - .6 Nails and spikes: to CSA B111.
  - .7 Wood screws: to ASME B18.2.1.

## 2.2. Fabrication

- .1 Fabricate members to following classifications:
  - .1 Appearance grade:
    - .1 Cross-laminated timber: Architectural
- .2 Mark glued-laminated and/or cross-laminated members for identification during erection. Marks not to be visible in final assembly.
- .3 Do not apply sealer to areas which are to receive stained finish or preservative treatment. Coordinate with Section 09 91 00.
- .4 Design connections to CSA O86, and CSA S16 unless specifically detailed, to resist shears, moments and forces indicated.
  - .1 Fabricate in accordance with CSA S16.
- .5 Galvanize connections after fabrication.

## PART 3 - EXECUTION

### 3.1 Examination

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glued-laminated and/or cross-laminated material installation in accordance with manufacturer's written instructions.

Cross-Laminated Construction

---

- .1 Visually inspect substrate in presence of General Contractor.
- .2 Inform General Contractor of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 Erection**

- .1 Protect protective sealer from damage before erection.
  - .1 Touch up damaged areas on site with specified sealer.
- .2 Erect or cross-laminated members in accordance with erection drawings issued for construction.
- .3 Brace and anchor members until permanently secured by structure.
- .4 Make adequate provisions for erection stresses.
- .5 Splice and join only at locations as indicated on for construction erection drawings.
- .6 Do not field cut or alter members without manufacturer's approval. If approved, preservative treat cut ends.

### **3.3 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.

### **3.4 Protection**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by cross-laminated construction installation.

**END OF SECTION**

## **PART 1- GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Work of this section includes architectural woodwork including, but not limited to, the following:
    - .1 Standing and running trim.
    - .2 Cabinetry and hardware.
    - .3 Interior solid wood ceilings.
    - .4 Plastic laminate.
    - .5 Solid surfacing countertops and fabrications.
    - .6 Tackboards.
    - .7 Wood benches.
    - .8 Factory and site finishing of architectural woodwork.

### **1.2 Administrative Requirements**

- .1 Coordination:
  - .1 Coordinate with other work for satisfactory and expeditious completion of the work of this section.
  - .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 Coordinate with partition accessories, electrical, communications, and finish components to ensure that proper provisions are made for the installation of the work of this section and for work by others.
  - .5 *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.

### **1.3 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
  - .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 Certificates:

Architectural Woodwork

---

- .1 Fire retardant pressure treated lumber or panel materials and water resistant panel materials shall be accompanied by supplier's certificate of conformance with this specification.
- .2 Include manufacturer's written instructions for finishing treated material.
- .4 Shop drawings:
  - .1 Submit shop drawings for the work of this section complying with the Architectural Woodwork Standards Edition 2-2014 requirements.
  - .2 Indicate quality standards and grades.
  - .3 Include full scale drawings of all exposed-to-view edge conditions.
  - .4 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.
  - .5 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 Architectural Woodwork Standard finish system number, sheen, and required application steps.
  - .6 Submit coordination drawings indicating locations of concealed grounds, cut-outs, plates, and other required fabrications.
  - .7 Show relation to adjoining construction, details of outside and inside corners and door openings.
- .5 Selection samples:
  - .1 Casework hardware, one unit of each type and finish.
- .6 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:
    - .1 Shop finished materials, showing each type of finish and colour.
    - .2 Samples of each specified *Product*, in each specified colour and finish.
    - .3 Sample of wood for interior wood ceilings.
    - .4 Solid surfacing, in each specified colour and finish.
    - .5 Plastic laminates, in each specified colour and finish.
    - .6 Tackboard, diagonally cut to show cross section through assembly, complete with accessories and trim.

Architectural Woodwork

---

**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 5 % of each type actually installed, but not less than 2 sets.

**1.5 Quality Assurance**

- .1 Qualifications:
  - .1 Manufacturers:
    - .1 Architectural woodwork shall be manufactured by a firm having a minimum of 5 years experience on work of similar size and quality.
    - .2 Fabricator solid surfacing: Fabrication to be performed by a solid surface manufacturer's certified fabricator Submit certification letter prepared by the solid surfacing manufacturer.
  - .2 Installers / applicators / erectors: engage an installer who 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 Architectural Woodwork Standards Edition 2-2014, Premium Grade, or the highest grade available for performance and appearance characteristics of materials in Sections 3 – 5 used that apply to *Product* fabrication and installation requirements governed by Sections 6 – 12.
- .3 Mock-ups:
  - .1 *Provide* mock-ups for the following:
    - .1 All veneer and solid wood types.
    - .2 All edge and joint types.
    - .3 Solid wood ceilings, 4 m x 4 m.

**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.

## Architectural Woodwork

---

- .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 Architectural Woodwork Standard's 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.
  - .3 During service life of woodwork: Obtain and comply with woodwork manufacturer's advice for optimum temperature and humidity conditions.

## 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 Architectural Woodwork Standards Edition 2-2014 and additional or greater loading capacities as specified throughout the Architectural Woodwork Standards.
- .2 Maximum allowable adjustable shelf lengths shall comply with shelves assembly rules per the Architectural Woodwork Standards Edition 2-2014 based on shelf thickness indicated or scheduled.

### 2.2 General

- .1 Single-source manufacturing and Installation responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.

### 2.3 Wood Materials

- .1 Lumber:
  - .1 Hardwood for concealed blocking and framing: Economy 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 Hardwood veneer:
  - .1 WDV1: reserved.
  - .2 WDV2:

Architectural Woodwork

---

- .1 Species: White Oak.
- .2 Grade: AA.
- .3 Cut: Rift.
- .4 Veneer leaf matching: Book.
- .3 Solid wood:
  - .1 WDS1:
    - .1 Species: Eastern White Cedar.
    - .2 Grade: Standard #1.
    - .3 Good 1 face, 2 edges, sound tight knots, pencil size hole allowed, no surface rot, minimal wane and twists, tongue and groove.
  - .2 WDS2:
    - .1 Species: White Oak or Maple.
    - .2 Cut: Rift.

## **2.4 Panel Materials**

- .1 Panel material schedule; except where indicated otherwise:
  - .1 Thickness: 19 mm (3/4") minimum.
  - .2 Core panels:
    - .1 At plastic laminate work: as scheduled in Plastic Decorative Laminate Casework Schedule at the end of this section.
    - .2 Plywood backing; countertops, benches and where indicated: exterior grade DFP, veneer core, with no added urea-formaldehyde used in composition.
    - .3 Drawer sides, backs and bottoms: Baltic Birch, minimum 12.7 mm (1/2").
- .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: to ANSI/HPVA HP-1-2009.
    - .2 Softwood plywood: to US Plywood Standard APA PS-1-09.
  - .2 Baltic Birch; exposed and semi-exposed: Birch facers and core veneers, type 2 hot press glue bond (E-1 rating meets European low formaldehyde emission standard), European Face Grade B - Premium grade on exposed faces (patch free clear faces, uniform white in colour), premium edge quality where cut to expose, free of gaps and defects.
  - .3 Fire rated plywood shall be pressure impregnated with fire-retardant chemicals to CAN/CSA O80 and have Flame Spread Value (FSV) of not more than 25 to CAN/ULC-S102-10.
- .3 Medium density fibreboard (MDF):
  - .1 To ANSI A208.2-2009, 16mm (5/8") minimum thickness, 720 kg/m<sup>3</sup> (45 lbs/ft<sup>3</sup>) minimum density and as follows:

Architectural Woodwork

---

- .1 Grade: 130.
- .2 Formaldehyde emission: F21 for panel thicknesses greater than 8mm (5/16") and F13 for panels equal to or thinner than 8 mm (5/16"). No added urea-formaldehyde used in composition,
- .2 Fire retardant medium density fibreboard (MDF) shall comply with the following requirements in addition to the above requirements:
  - .1 No Ammonium Polyphosphate used in composition.
  - .2 Maximum values in accordance with CAN/ULC-S102-10:
    - .1 Flame Spread Value (FSV): Maximum 25.
    - .2 Smoke Developed Value (SDV): Maximum 50.

## 2.5 Plastic and Composite Materials

- .1 High pressure decorative laminate:
  - .1 General purpose grade: ANSI/NEMA LD 3-2005, Horizontal General Purpose Grade (HGS).
    - .1 Acceptable *Products*, colours and finishes:
      - .1 PLAM1: Abet Laminati HPL, 405 Bianco Porcellana (white), finish: SEI (matte).
      - .2 PLAM2: Abet Laminati HPL, 879 Grigio Grafite (charcoal), finish: SEI (matte).
    - .2 Acceptable manufacturers:
      - .1 Formica.
      - .2 Laminart.
      - .3 Nevamar.
      - .4 Pionite.
      - .5 Wilsonart.
  - .2 Solid colour through decorative laminates (edgebanding at exposed and semi-exposed panel edges):
    - .1 Colour through decorative laminate, general purpose grade: ANSI/NEMA LD3-2005, Horizontal General Purpose Grade (HGS).
    - .2 Basis of design, colours and finishes:
      - .1 Match adjacent PLAM product, colour, and finish.
- .2 Solid surfacing sheet (SSF1):
  - .1 Homogenous (not coated, laminated or composite construction), filled material containing methyl methacrylate.
    - .1 Basis of design: Dupont 'Corian'.
    - .2 Nominal sheet thickness:
      - .1 Counters and side panels: 13 mm (1/2") and 19 mm (3/4").

Architectural Woodwork

---

- .2 Backsplashes: 6 mm (1/4").
- .3 Colour/pattern: Glacier White.
- .2 Accessories:
  - .1 Joint adhesive: Manufacturer's standard adhesive to create inconspicuous, nonporous joints, with a chemical bond.
  - .2 Sealant: Mildew resistant sealant in accordance with Section 07 92 00.
  - .3 Sink/bowl mounting hardware: manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.
  - .4 Sink:
    - .1 Basis of design:
      - .1 Dupont 'Corian 8252' undermount integrated lavatory sink with side overflow.
      - .2 Colour: to match Corian 'Glacier White'.
- .3 Engineered stone; quartz-based fabricated stone surfacing (SSF2):
  - .1 Composition: quartz aggregate combined with resins and pigments and fabricated into slabs, and as follows:
    - .1 Thickness: 20 mm.
  - .2 SSF2:
    - .1 Basis of design:
      - .1 CaesarStone.
        - .1 Colour: 4004 Raw Concrete.
    - .2 Basis of design:
      - .1 Zodiaq Stone.
        - .1 Colour: to match CaesarStone, 4004 Raw Concrete

## 2.6 Tackboards

- .1 Krommenie cork tackboard: 12.7 mm (1/2") factory prelaminated consisting of 6 mm (1/4") thick Forbo 'Bulletin Board' linoleum cork laminated to 6 mm (1/4") plywood substrate under mechanical pressure in maximum panel sizes of 1219 mm x 2438 mm (4'-0" x 8'-0"). Bonding of materials by a waterproof adhesive that will not delaminate or rupture at the contact surfaces.
  - .1 Colours of tackboard:
    - .1 TKS1:
      - .1 Basis of design: Forbo Bulletin Board '2202 Black'.
    - .2 TKS2:
      - .1 Basis of design: Forbo Bulletin Board '2187 Light Beige'.
  - .2 Sizes and configuration: as indicated.
- .2 Edge trim:

Architectural Woodwork

---

- .1 Basis of design: JOLLY by Schluter, Anodized Aluminum Satin Clear
- .2 Trim shall be sized to suit thickness of tackable surface. Finish: Stainless steel. Locations: Provide for all exposed edges and outside corners. All exposed edges shall be ground smooth. Mounting as recommended by manufacturer.
- .3 Locations: exposed edges and outside corners.
- .3 Final assembly to have seamless/welded flush and level butt joints. No visible joints accepted and no intermediate trim or exposed fasteners.

## 2.7 Fasteners and Adhesives

- .1 Wood screws: FF-S-111D Amendment 1 (1989), type, size, material and finish as required for the condition of use.
- .2 Nails: FED FF-N-105, type, size material and finish as required for the condition of use.
- .3 Anchors: Type, size material and finish as required for the condition of use.
- .4 Fastening devices shall be set or countersunk flush with surface of framing member. No exposed fasteners permitted. Where accepted by *Consultant*, exposed fasteners shall be flat head hex socket cap screws and matching joint connector sex bolts (also known as Chicago screws or post and screw) by Murakoshi, distributed by Richelieu, Spaenaur Joint Connector bolt with decorative head, hex drive series; finish as selected by *Consultant*.
- .5 Adhesives: Type II water resistant, except use Type I waterproof in wet environments.

## 2.8 Hardware

- .1 Casework hardware; to be furnished and installed by the architectural woodwork manufacturer.
  - .1 Drawer slides with positive stop: Hafele 422.59 series, self-closing, black or stainless steel as designated.
  - .2 Drawer slides (heavy duty): drawers 1067 mm (42") wide or less: Accuride 3640 all ball bearing, rail/bracket mount, full extension + 25 mm (1") over travel slides, hold-in detent, with a 90 kg load rating, and sequential movement, clear zinc finish.
  - .3 Magnetic catches: Hafele 246.29.301.
  - .4 Hanging file slides: Hafele 422.71.901.
  - .5 Hinges:
    - .1 Full overlay: Richelieu Full Overlay Hinge, 110°.
    - .2 Half overlay: Richelieu Half Overlay Hinge, 110°
    - .3 Chest lid stay: Richelieu 575990.
    - .4 For Dutch Doors: SOSS invisible hinges as distributed by Lee Valley Tools, size to suit door thickness and overall dimensions, stain chrome finish. Supply and install cupped magnet sets and stop gasket to ensure positive, silent closure.
    - .5 Continuous heavy duty Piano hinge, aluminum. *Provide* cupped magnet sets and stop gaskets to ensure positive silent closure
  - .6 Pulls; doors and drawers: Dayvan SS-261/15578 or approved equivalent.

Architectural Woodwork

---

- .7 Locks: Hafele Cylinder Module System, deadbolt locks, stainless steel finish. All cabinets to be lockable.
- .8 Grommets: Richelieu Stainless Steel, D032030.
- .9 Adjustable shelf pins/sockets: Richelieu, Nickel 128180 Series supports and sockets.
- .10 Wiring tray: 50 mm (2") deep U-profile, welded wire mesh cable management system, mesh measurement of 50 mm (2") x 200 mm (8"), tray width 100 mm (4"), electrogalvanized, 'Express Tray' by Thomas & Belts, complete with galvanized steel wall clamps and fasteners.
- .11 Bumpers; 2 per each drawer and door: Rubber 3M (peel & stick).
- .12 Levellers: # 101 Steel - zinc coated or Hafele #637.67.900 zinc coated. (Hafele Tel.910.889.2322).
- .13 Hook: Richelieu 51124170.
- .14 Closet rod bracket: Richelieu 352730.
- .15 Closet rod: Richelieu 4310830.
- .16 Adjustable table Legs: E Legs with levelling adjustment, brushed steel finish by Hafele.

## 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.
- .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* lumber framing for architectural woodwork, complete with all 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 Do fabrication from field measurements with provisions for scribing as required to meet built-in conditions.
- .7 Maintain relative humidity and temperature during fabrication, storage and finishing operations matching that of the areas of installation.
- .8 Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects. Accurately fit all joints, corners and mitres.

Architectural Woodwork

---

- .9 *Provide* balancing sheets as required, and specified, complying with the Architectural Woodwork Standards Edition 2-2014.
- .10 *Provide* surface mount blocking & strapping necessary to support the work of this section. Such blocking shall not be exposed upon completion of work.
- .11 Prefinish work at the factory, except where specified or indicated otherwise.
- .12 Solid wood edging: No end grain shall be visible; mitre external corners; house internal corners.

**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.

**2.11 Fabrication – Wood Ceiling Panels**

- .1 Solid wood ceilings: Cedar tongue and groove, WDS1.
- .2 Provide direct screw attachment at locations noted and where access is not required.
- .3 Fixings, hangers, suspension system: concealed, to suit wall and ceiling installations and as indicated.
  - .1 Suspension system: in accordance with Section 09 22 00.

**2.12 Finishing of 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.
- .1 WDS1:
  - .1 Water repellent, UV resistant, penetrating two coat finish.

## Architectural Woodwork

---

- .1 Basis of design:
  - .1 Sansin 'SDF' base coat and 'SDF' top coat.
  - .2 Color: to later selection by *Consultant*.
- .2 WDS2 and WDV2:
  - .1 White wash finish; 2-part cerused stain finish, 10° sheen conversion vinyl varnish seal and topcoat; AWMAC system #5 with custom filled finish.

### PART 3- EXECUTION

#### 3.1 Preparation

- .1 Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- .2 Ensure that environmental conditions have been provided as requested and specified.
- .3 Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.
- .4 *Provide* all grounds, nailers and other required fabrications which are to be built into other work when required.
- .5 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.
- .6 Verify that required priming of woodwork has been completed.
- .7 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 Architectural Woodwork Standards Edition 2-2014 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 – Tackboards

- .1 Install in accordance with manufacturer's installation instructions.
- .2 Use laminating adhesives as required to manufacturer's specifications.

## Architectural Woodwork

- .3 Install secure, plumb and square, using concealed fasteners.
- .4 Construction joint locations to *Consultant's* approval.

### 3.4 Installation – Tongue and Groove Wood Ceiling Panels

- .1 General: condition wood panels to average prevailing humidity in installation area prior to installing.
- .2 Install metal suspension system in accordance with Section 09 22 00.
- .3 Check wood panel items delivered to ensure that they conform to the reviewed shop drawings. Examine reviewed shop drawings and *Contract Documents* for correct quantities of material required, their exact location, function and operation, and check delivered items to ensure that requirements are met.
- .4 Hang panels where indicated, with uniform margins and requisite allowances. Readjust and check panels upon completion of work, correcting alignment problems caused by paint, moisture or improper fixing.
- .5 Clean wood after installation, removing dust, dirt and fingerprints.

### 3.5 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 Architectural Woodwork Standards Edition 2-2014.

### 3.6 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.

### 3.7 Protection

- .1 Protect architectural woodwork during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.
- .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*.

### 3.8 Plastic Decorative Laminate Casework Schedule

<b>Premium Grade</b> Applicable to casework indicated as 'Plastic laminate' or PLAM.  Plastic laminate = High Pressure Decorative Laminate Melamine = Low Pressure Decorative Laminate		
Surface	Decorative Face Material	Panel material (core)

Architectural Woodwork

Exposed exterior surfaces	Plastic laminate	MDF
Exposed interior surfaces	Plastic laminate	MDF
Semi-exposed surfaces - with exception of cabinet bottoms and shelves	Melamine	MDF
Semi-exposed surfaces - cabinet bottoms	Plastic laminate	Veneer Core plywood
Semi-exposed surfaces - adjustable shelving	Plastic laminate	MDF or Veneer Core plywood
Drawer sides, backs, and bottoms	Plastic laminate	Baltic Birch
Concealed surfaces	Mill option	
Countertops	As indicated on drawings	
Exposed and semi-exposed panel edges	Colour through plastic laminate edgebands.	

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Wood decking.
  - .2 Wood fencing.

### **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 for each type of *Product* and process proposed for use in the work of this section.
- .3 Samples:
  - .1 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:
    - .1 Lumber, showing each type of finish, edge treatment and grain.
    - .2 Deck fastening system components.

### **1.4 Closeout Submittals**

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
  - .1 Submit maintenance data for incorporation into maintenance manuals.

### **1.5 Quality Assurance**

- .1 Qualifications: work of this section shall be executed only by a *Subcontractor* who has adequate plant, equipment, and skilled tradespersons to perform work expeditiously, and is known to have been responsible for satisfactory installations similar to that required in the *Work* during a period of at least the immediate past 5 years.
- .2 Mock-ups:
  - .1 *Provide* mock-ups, with specified finish, of sizes and in locations as directed by *Consultant* for the following:
    - .1 Deck.
    - .2 Fence.

Exterior Architectural Woodwork

---

## **1.6 Delivery, Storage, and Handling**

- .1 Protect woodwork during transit, delivery, storage and handling to prevent damage and deterioration.
- .2 The *Subcontractor* and the *Contractor* shall be jointly responsible to make certain that 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.

## **PART 2 – PRODUCTS**

### **2.1 Lumber Materials**

- .1 Exposed wood for fencing and decks.
  - .1 Species: Tamarack.
  - .2 Cut: quarter sawn.
  - .3 Kiln dried heartwood.
- .2 Softwood lumber; for concealed framing and furring:
  - .1 Softwood lumber, S4S, moisture content not greater than 19% at time of installation, in accordance with following standards:
    - .1 CSA O141-05.
    - .2 NLGA-2010.
  - .2 Furring, blocking, nailing strips, grounds:
    - .1 Use S2S material.
    - .2 Board sizes: Spruce species, NLGA-2010 construction grade, S-DRY.

### **2.2 Accessories**

- .1 Drilled fasteners:
  - .1 Series 300 stainless steel #8 Robertson.
- .2 Bolt, nut, washer, screw and pin type fasteners: Series 300 stainless steel.
  - .1 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.
    - .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.
- .3 Dowels: matching lumber species, grade and cut dowels.
- .4 End sealer; for cut hardwood lumber board ends: Mobil CER-M or equal clear aqueous wax sealer as recommended by lumber supplier.

### **2.3 Finishes**

- .1 Finish for exposed wood, deck and fence:

Exterior Architectural Woodwork

---

- .1 UV resistant, 100% acrylic formula.
- .2 Basis of design:
  - .1 Behr 'Semi-Transparent Weatherproofing All-in-One Wood Stain & Sealer, No. 5077'
- .3 Colour: Slate.

## **2.4 Source Quality Control**

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

## **PART 3 - EXECUTION**

### **3.1 General**

- .1 Layout work carefully and 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 installations.
- .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 site conditions, and adequate for intended support.
- .6 Cut work into lengths as long as practical and with square ends. Erect work plumb, in true planes, and fastened rigidly in place.
- .7 Immediately after cutting, apply end sealer to cut ends of lumber boards with clear aqueous wax sealer.
- .8 Fastenings:
  - .1 Wood shall be pre-drilled for fasteners with countersunk bit.
    - .1 At concealed locations, set fasteners flush with finished face of wood.
    - .2 At exposed locations, countersink fasteners and conceal with glued hardwood dowels.
  - .2 Evenly space fasteners and align in both directions.
  - .3 Fasteners shall not bind or crush wood fibres.

### **3.2 Finish**

- .1 Apply stain in accordance with Section 09 91 00.
- .2 Prime coat of stain may be reduced in accordance with manufacturer's directions.

**END OF SECTION**

Bituminous Dampproofing

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Bituminous dampproofing.

### **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.

### **1.3 Quality Assurance**

- .1 Qualifications: Execute the work of this section only by a *Subcontractor* who has adequate plant, equipment and skilled workers to perform it expeditiously, is known to have been responsible for satisfactory installations similar to that specified.
- .2 Maintain one copy of manufacturer installation instructions on site.

### **1.4 Field Conditions**

- .1 Installation shall not be performed during rainy or inclement weather and on frost or wet covered surfaces.
- .2 Do not apply materials in wet weather or on wet substrates.
- .3 Store membrane at temperature of 5°C and above to facilitate handling.
- .4 Store role materials horizontally in original packaging.
- .5 Store adhesives and primers at temperatures of 5°C and above to facilitate handling.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Dampproofing coating; for ambient and substrate temperatures below 5°C:
  - .1 Primer: Penetrating asphalt primer, to CGSB 37-GP-9Ma-1983.
  - .2 Cut-back asphalt: to CAN/CGSB 37.16-M89.
- .2 Dampproofing coating; for ambient and substrate temperatures above 5°C:
  - .1 Mineral colloid asphalt emulsion: to CAN/CGSB 37.2-M88.
- .3 Sealing compound, rubberized asphalt: to CAN/CGSB 37.29-M89 and as recommended by Dampproofing manufacturer.

Bituminous Dampproofing

---

**PART 3 - EXECUTION**

**3.1 Application**

- .1 Before applying dampproofing, seal holes around pipes and penetrations and services using sealing compound.
- .2 Apply dampproofing to indicated locations and to a line no less than 150 mm (6") below finished grade level.
- .3 Dampproofing coating; for ambient and substrate temperatures below 5°C:
  - .1 Apply primer at rate of 0.5 to 2 l/m<sup>2</sup> (100 to 400 ft<sup>2</sup>/gal) and allow curing until touch dry.
  - .2 Apply top coat at rate of 1 to 1.5 l/m<sup>2</sup> (2 to 3 gal/100 ft<sup>2</sup>) and allow to cure.
- .4 Dampproofing coating; for ambient and substrate temperatures above 5°C:
  - .1 Apply asphalt emulsion foundation coating diluted 20% with potable water at the rate of 0.5 l/m<sup>2</sup> (1 gal/100 ft<sup>2</sup>) as a primer and allow drying.
  - .2 Apply second coat of undiluted asphalt emulsion foundation coating at rate of 1 to 1.5 l/m<sup>2</sup> (2 to 3 gal/100 ft<sup>2</sup>) and allow drying.

**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.

### **1.4 Quality Assurance**

- .1 Execute the work of this section only by a *Subcontractor* who has adequate plant, equipment and skilled workers to perform it expeditiously, is known to have been responsible for satisfactory installations similar to that specified, and has been approved in writing by the self-adhered waterproofing system manufacturer for the installation of their *Product*.
- .2 Mock-Up:
  - .1 Construct area of typical waterproofing installation for approval. 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 Provide forced air circulation during curing period for enclosed applications.
- .2 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.
- .3 The work of this section may proceed at temperatures below 4°C only with mutual documented agreement of inspection and testing company, manufacturer and applicator that, with materials and methods used, specified installation will be achieved.
- .4 Ensure application temperature and humidity recommended by material manufacturer are maintained before, during and after installation.
- .5 Provide forced air circulation or adequate natural ventilation during installation and curing periods for enclosed application.
- .6 Do not expose materials vulnerable to water or sun damage in quantities greater than can be installed the same day.
- .7 Install waterproofing on dry surfaces, free of snow and ice and during weather that will not introduce moisture into waterproofing system.

Self-Adhering Sheet Waterproofing

---

**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 1.5 mm (1/16").
    - .1 Film: 4 mils.
    - .2 Polymeric membrane: 56 mils.
  - .2 Tensile strength: to ASTM D412-15a.
    - .1 Film: 40.71 MPa (5,900 psi) minimum.
    - .2 Polymeric membrane: 4.07 MPa (590 psi) minimum.
  - .3 Elongation: to ASTM D412-15a.
    - .1 Polymeric membrane: 455 percent minimum.
  - .4 Water vapour transmission: to ASTM E96/E96M-10, Method B: 0.05 grains/ft<sup>2</sup>/hour.
  - .5 Water absorption: to ASTM D570-98(2010)e1, 0.1%, 72 hours maximum.
  - .6 Resistance to hydrostatic head: equivalent to 45.72 m (150 ft) of water.
  - .7 Puncture resistance: to ASTM E154/E154M-08a(2013)e1, 67 pounds.
  - .8 Acceptable *Products*:
    - .1 Henry 'Blueskin WP 200'.
    - .2 Colloid Environmental Technologies Company (CETCO) 'Envirosheet', as distributed by DRE Industries Inc.
    - .3 Grace 'Bituthene 3000' and 'Bituthene Low Temperature'.
    - .4 Soprema 'Colphene 3000'.
    - .5 W.R. Meadows 'Mel-Roll'.
- .2 Primer/surface conditioner: In accordance with membrane manufacturer's printed installation instructions.
- .3 Bonding asphalt: Single component bonding asphalt. Use manufacturer's proprietary mastic.

### Self-Adhering Sheet Waterproofing

---

- .4 Mastic; self-adhered membrane systems: Single component, utility grade, rubber based sealant. Use manufacturer's proprietary mastic.
- .5 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 Virgin polypropylene.
    - .2 Polystyrene.
  - .2 Acceptable *Products*
    - .1 W.R. Meadows 'Sealtight Mel-Drain 5035'.
    - .2 Hydrotech 'Hydrodrain 400'.
    - .3 Carlisle Coatings & Waterproofing 'CCW MiraDRAIN 6000'.
    - .4 TerraFix Geosynthetics Inc. 'Terradrain 600'.
    - .5 Grace 'Hydroduct 200'.
    - .6 Cosella-Dorken Products Inc. 'Delta-Drain 6000 HI-X'.
    - .7 'TREMDrain 1000' by Tremco Incorporated.

## PART 3- EXECUTION

### 3.1 General

- .1 Comply with manufacturer's *Product* data, including *Product* application and installation instructions, 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.

### 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 should 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:

### Self-Adhering Sheet Waterproofing

---

- .1 Condition surfaces to receive waterproofing membrane using primer/surface conditioner applied by spray or roller in accordance with manufacturer's mixing and application instructions.
- .2 Allow primer/surface conditioner to dry adequately before proceeding with waterproofing membrane. Avoid pooling and excess of primer/surface conditioner. Primed surfaces not covered by waterproofing membrane on the same day must be re-primed.
- .3 Metal surfaces need not be primed, but should be free of grease, oil, dirt, loose paint, rust or any other contaminants.

### 3.3 Vertical Membrane Installation

- .1 Apply waterproofing membrane system in accordance with manufacturer's instructions.
- .2 Provide a chalk line or alternate means of establishing a square start location. Align first sheet of membrane with straight edge and after removing first few feet of release paper from roll lay membrane into place. Continue to pull release paper from roll thereby adhering the membrane onto the substrate. Proceed at a rate that allows opportunity to prohibit air from becoming entrapped between membrane and substrate.
- .3 Continue with subsequent rolls aligning each with previous along lap lines provided on membrane. Maintain a minimum overlap of 64 mm (2-1/2").
- .4 End laps as encountered at roll ends and splices should overlap the previous membrane a minimum of 150 mm (6"). Stagger end laps. Point exposed edges and terminations with pointing mastic to prevent water from travelling under membrane. Lap to shed water.
- .5 Lay membrane carefully to ensure a uniform application and to minimize fishmouths (wrinkles extending to membrane's edge).
- .6 Horizontal to vertical inside corner transition areas are to be pre-treated with manufacturer's proprietary fillet extending 19 mm (3/4") vertically and horizontally from the corner. Apply a minimum 225 mm (9") strip of membrane centred at the joint.
- .7 Immediately following placement, roll membrane in its entirety to ensure continuous adhesion to the substrate. For verticals, use membrane roller as recommended by manufacturer.
- .8 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.
- .9 On vertical and horizontal applications membrane terminations shall receive an edge dressing of waterproofing mastic to protect against undermining effects of ponded water or vertical drainage.
- .10 Detail work:
  - .1 Over non-working joints or cracks up to a maximum of 5 mm (3/16"), apply a reinforcing strip of waterproofing membrane, not less than 225 mm (9") in width centered over the joint/crack.
  - .2 Non-working joints or cracks greater than 5 mm (3/16") in width, notify *Consultant*. Joints shall be filled flush to the level of the surrounding deck surface prior to the placement of a 225 mm (9") reinforcing strip of waterproofing membrane. Waterproofing liquid membrane should be used to fill voids of this nature.

### Self-Adhering Sheet Waterproofing

---

- .3 Cold pour joints: Grind or chip as required to smooth joint/crack prior to field membrane application. Treat in same manner as non-working joints/cracks less than 5 mm (3/16") wide.
- .4 Inspect vertical and horizontal inside/outside corner locations to ensure smoothness and regularity. Outside corners should be continuous and free of sharp edges. Inside corners should be free of rough edges resulting from formwork placement. Repair as required.
- .5 Install a reinforcing ply of waterproofing membrane over outside corners. Use a width of membrane not less than 225 mm (9") centred over the corner and press into full contact with the substrate. Reinforcing strips shall be installed prior to field membrane application.

### 3.4 Vertical Drainage Sheet

- .1 Backfilled application: Attach vertical drainage sheet to waterproofing assembly with integral filter fabric continuously to excavation, using manufacturers recommended adhesive which is compatible and approved by waterproofing manufacturer. Do not puncture or damage waterproofing integrity.
  - .1 Position the sheet with the flat side against the wall and filter fabric toward the soil/drainage side. Installation shall be made in such manner that soils are not permitted to migrate into drainage channels.
- .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.

### 3.5 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.
  - .1 Upon completion of the work of this section, have entire installation inspected by membrane manufacturer's authorized representative in the presence of *Consultant*.

**END OF SECTION**

Service Room Traffic Coatings

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Waterproof traffic coating systems (SRTC) for service room 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 Samples:
  - .1 Submit samples of each specified material, in each specified colour to show successive applications of each coat.

### **1.4 Closeout Submittals**

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Maintenance instructions:
  - .1 Submit maintenance instructions for incorporation into maintenance manuals.

### **1.5 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 *Provide* the work of this section only by an applicator who has adequate equipment and skilled workers to perform it expeditiously, is an applicator approved by *Supplier* of traffic surface materials, and is known to have been responsible for satisfactory installations similar to that specified.
    - .2 *Subcontractor* shall be a manufacturer certified installer, and shall have proven experience with specified system.
- .2 Mock-up:
  - .1 Construct 2 m<sup>2</sup> (20 ft<sup>2</sup>) mock-up panel of typical traffic surface waterproofing system at the *Place of the Work* as part of final installation for review, location to be determined by *Consultant*.

### **1.6 Delivery, Storage, and Handling**

- .1 Store materials at the *Place of the Work* in an area specifically set aside for purpose that is locked and ventilated. Maintain materials at minimum temperature of 15.5°C before use.

### Service Room Traffic Coatings

---

- .2 Ensure compliance with health and fire regulations during storage, handling and application.
- .3 Deliver and store materials undamaged, in original containers, with manufacturer's labels and seals intact.

#### 1.7 Field Conditions

- .1 Coat surfaces only with surface temperatures at a minimum of 10°C for 72 hours before, during and following application, or until cured, when no dust is being raised, and in well-ventilated and broom clean areas.
- .2 Ensure substrate is sound, dry, free of dust, dirt, paint, grease, oil or other foreign substances.
- .3 Ensure adequate ventilation during installation.
- .4 Advise other *Subcontractors* of fixtures and fittings not to be installed until traffic surface is cured.
- .5 Protect adjacent surfaces from damage resulting from work of this section. If necessary, mask and/or cover adjacent surfaces, fixtures, equipment, and the like by suitable means.
- .6 Concrete substrate conditions:
  - .1 Concrete shall be clean, sound, compressive strength 20 MPa (2900 psi) minimum, crack free and contain 3% maximum moisture content by mass.
  - .2 Test for moisture content in accordance with manufacturer's specifications and the following:
    - .1 Remove concrete chippings, wrap in vapour retardant plastic and deliver immediately to lab.
    - .2 Test in accordance with ASTM D1864/D1864M-89(2009)e1.
  - .3 Concrete shall be free from sealers or membrane curing agents or other foreign matter.
  - .4 Allow concrete to cure 28 days minimum before applying traffic surfacing.
  - .5 Concrete shall have light steel trowel finish.
  - .6 Finish surfaces shall be level, or straight where sloped to drains. Variation in plane of substrate shall not exceed 1:500. Deviations or deteriorated concrete shall be repaired prior to start of work of this section.

## PART 2 – PRODUCTS

### 2.1 Service Room Pedestrian Grade Traffic Coating

- .1 General performance requirements:
  - .1 System description:
    - .1 High-solids, fluid-applied, polyurethane, waterproofing, traffic-bearing, membrane deck coating system.
      - .1 Primer: 2-component, polyurethane-based adhesive primer.
      - .2 Base coat: 2-component, fast-curing, polyurethane base coat.

### Service Room Traffic Coatings

---

- .3 Top coat: 2-component, fast-curing, aromatic polyurethane or epoxy top coat.
- .2 System performance requirements:
  - .1 ASTM C957-15.
  - .2 VOC content: maximum 99 g/L.
  - .3 System shall be suitable for pedestrian traffic, skid resistant aggregate loaded top surface, and waterproof.
  - .4 System shall have aggregated slip-resistant surface.
  - .5 System shall be watertight.
- .3 Acceptable *Products*:
  - .1 Sika 'Sikafloor Resoclad MRW Type II' with 6001 Topcoat.
  - .2 Tremco 'Vulkem 350NF/950NF System'.
  - .3 Substitutions: in accordance with Section 01 25 00.
- .4 Colour: as selected by *Consultant*.
- .2 Waterproofing membrane:
  - .1 2-component 100% solids polyurethane waterproofing membrane.
  - .2 Thickness: 0.762 mm (30 mil) minimum.
  - .3 Basis of design: Sikalastic 'Duochem 390 Membrane'.

## 2.2 Auxiliary Materials

- .1 Each material used in the application of each flooring system shall be as recommended or manufactured by the *Supplier* of the coating.
- .2 Primers, crack and joint fillers, and block wall fillers and other fillers: as recommended by membrane manufacturer.
- .3 Sealant: in accordance with waterproofing system manufacturer's installation instructions.

## PART 3 - EXECUTION

### 3.1 Examination

- .1 Verify environmental and *Place of the Work* conditions are suitable for application and curing before commencing work of this section.
- .2 Examine surfaces to receive traffic surfacing. Surfaces shall be smooth, sound, dry, and free from conditions that will adversely affect execution, permanence, or quality of work. Test surfaces for moisture content to ensure that they are suitable for application, and fully cured.
- .3 Ensure that surfaces to receive traffic surfacing have been *Provided* as specified in the work of other sections, that they will not adversely affect execution, permanence, or quality of the work of this section, and that they can be put into acceptable condition by means of preparation specified in this section.

Service Room Traffic Coatings

---

- .4 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.

### 3.2 Notification

- .1 Report deficiencies in writing to *Consultant* prior to commencing the work of this section.
- .2 Commencement of work shall imply acceptance of surfaces and conditions.

### 3.3 Preparation

- .1 Thoroughly clean surfaces to receive coating by steel shot-blast, sandblast or other method in accordance with manufacturer's instructions.
- .2 Fill open control joints, and other cracks and voids with sand filled/epoxy mortar.
- .3 Clean, prime and seal surfaces as recommended by traffic surfacing manufacturer.
- .4 Rout or sawcut cracks exceeding 1.0 mm (0.04") in width and fill with manufacturer's recommended sealant.

### 3.4 Installation

- .1 General:
  - .1 Apply traffic surfacing in accordance with manufacturer's instructions.
  - .2 Apply traffic surfacing 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, within limitations of materials and areas concerned.
  - .3 Make clean true junctions with no visible overlap between adjoining applications of coatings.
  - .4 Place cloths and other disposable coating materials, that are a fire hazard, in closed metal containers and remove from building at the end of each *Working Day*.
- .2 Apply primer followed by traffic surfacing in accordance with manufacturer's instructions.
- .3 Embed waterproofing membrane within drain assembly in accordance with manufacturer's recommended details to provide watertight seal.
- .4 Apply top coat to achieve a uniform, slip resistant surface.
- .5 *Provide* 200 mm (8") high integral coved base to columns, walls, and against vertical surfaces, unless otherwise indicated.
- .6 Match finished work to accepted samples; uniform in thickness, sheen, colour, texture and be free from defects detrimental to appearance or performance.

### 3.5 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00, and as follows:
  - .1 *Contractor's* field quality control:
    - .1 Verify by Tooke thickness gauge, and in the presence of *Consultant*, that thicknesses of complete traffic surfacing is in accordance with the *Contract Documents*.

Service Room Traffic Coatings

---

**3.6 Adjusting and Cleaning**

- .1 As work progresses, promptly remove spilled or spattered coating materials from surfaces of work performed under other sections.

**3.7 Protection**

- .1 Advise other *Subcontractors* of fixtures, fitting and finishing not to be installed or started until decking is completed.
- .2 Traffic control: prohibit other *Subcontractors* from entry into areas during application and until surface has cured, and include protection after cure against damage by other *Subcontractors*.
- .3 Apply temporary protection of completed traffic surfacing as required.
- .4 Cover or mask surfaces adjacent to those receiving traffic surfacing to protect work of other sections and property from damage and soil.

**END OF SECTION**

Graffiti Protection Sealer

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Graffiti protection sealer at precast concrete.

### **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 Manufacturers' instructions:
  - .1 Submit fully detailed installation instructions for review prior to commencing 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 maintenance instructions for incorporation into 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:
    - .1 *Provide* work of this section, executed by competent installers with experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
  - .1 Provide minimum 10 m<sup>2</sup> (100 ft<sup>2</sup>) test mock-up panel of typical graffiti protection sealer at the *Place of the Work* as part of final installation for review, location to be determined by *Consultant*.

### **1.6 Field Conditions**

- .1 Apply sealer only on surfaces of materials within a moisture content and temperature range specified by sealer manufacturer.
- .2 *Provide* necessary ventilation for proper execution of work of this section.

## Graffiti Protection Sealer

---

- .3 *Provide* temporary enclosures and temporary heat during the winter months, to maintain minimum surface and ambient temperatures to manufacturer's specifications.

## PART 2 - PRODUCTS

### 2.1 Materials

- .1 General:
  - .1 Install only *Products* as supplied by one manufacturer/*Supplier* for work of this section.
  - .2 Graffiti protection sealer: UV stable, transparent water vapour permeable, low VOC, waterborne silane-based sealer system for porous mineral building materials surfaces. Sealer shall not darken substrate or alter its appearance and shall repel paints and markers while allowing removal of graffiti paints and markers using over the counter environmental friendly cleaners.
  - .1 Basis of design:
    - .1 Evonik Industries 'Protectosil ANTIGRAFFITI'.
    - .1 Primer: Evonik Industries 'Protectosil ANTIGRAFFITI Primer'

## PART 3 - EXECUTION

### 3.1 Examination

- .1 Verify that specified environmental conditions are ensured before commencing work of this section.
- .2 Test surfaces for moisture content to ensure that they are suitable for application, and otherwise verify that concrete has cured and that surfaces are satisfactory for sealing in accordance with sealer manufacturer's substrate condition requirements.
- .3 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 Prepare and clean surfaces prior to sealer application by removing laitance, dust, dirt, oil, debris, loose concrete, and anything detrimental to application and bonding of sealer.
- .2 Preparation of substrate shall be sole responsibility of this *Subcontractor*, and must be to sealer manufacturer's requirements, and to approval of *Contractor* and *Consultant*.
- .3 Mask surfaces not intended to receive chemical coating.
- .4 Prior to sealer application, confirm compatibility of joint sealants, materials and *Products* in contact with sealer coating.
- .5 Ensure provision of adequate ventilation and exhaust to ensure dust, vapours, fumes, and odours resulting from surface preparation and sealer application do not create a nuisance or health hazard. Comply with environmental requirements of jurisdictional authorities.

### 3.3 Application

- .1 Apply sealer coating in accordance with manufacturer's printed installation instructions.

#### Graffiti Protection Sealer

---

- .2 Apply graffiti protection sealer to a height of 2400 mm above grade.
- .3 Apply at temperature and weather conditions recommended by the sealer manufacturer.
- .4 Surface residue shall be brushed out thoroughly until they completely penetrate into the surface.
- .5 On porous substrates, dilute the first coat of sealer coating in accordance with manufacturer's installation instructions. Allow to completely dry before sealer coat application.
- .6 Apply 3 coats of sealer at manufacturer's recommended rate; first and second coats spray applied and final coat applied by brush.
- .7 Allow to completely dry between sealer coat applications.

### **3.4 Adjusting and Cleaning**

- .1 Upon completion of work of this section, remove debris, excess materials, tools and equipment from *Place of the Work*. Clean up, and leave work in an acceptable condition.

### **3.5 Protection**

- .1 Erect suitable barriers to prevent traffic and other trades from working in areas during application and curing of coating.
- .2 Mask and/or cover adjacent surfaces, fixtures and equipment by suitable means. Correct any damage at own expense.
- .3 Store combustible materials in closed metal containers. Remove empty containers from *Place of the Work* daily.

**END OF SECTION**

## **PART 1- GENERAL**

### **1.1 Summary**

- .1 Section includes thermal insulation types as indicated in Section 07 21 01.

### **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:
  - .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.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Execute work of this section using a *Subcontractor* 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.

## **PART 2- PRODUCTS**

### **2.1 Insulation Materials**

- .1 Read in conjunction with Section 07 21 01.
- .2 INS-10:
  - .1 Rigid insulation board; regular strength.
  - .2 Extruded polystyrene, closed-cell, smooth skin, to CAN/ULC S701-11, Type 4, 210 kPa (30 psi) compressive strength.
  - .3 Acceptable *Products*:
    - .1 Dow 'Styrofoam SM'.
    - .2 Owens Corning 'Foamular C-300'.
    - .3 Substitutions: in accordance with Section 01 25 00.
- .3 INS-10(40):

Thermal Insulation

---

- .1 Rigid insulation board; high load 40:
- .2 Extruded polystyrene, closed-cell, smooth skin, to CAN/ULC S701-11, Type 4:
- .3 Compressive Strength, ASTM D1621-16, 275 kPa (40 psi) minimum (measured at 5% deformation or at yield, whichever occurs first).
- .4 Acceptable *Products*:
  - .1 Dow 'Styrofoam Highload 40'.
  - .2 Owens Corning 'Foamular 400'.
  - .3 Substitutions: in accordance with Section 01 25 00.
- .4 INS-20:
  - .1 Batt insulation.
  - .2 Unfaced, mineral-fibre batts, formaldehyde-free, to CAN/ULC S702-09, Type 1.
  - .3 Acceptable manufacturers:
    - .1 Johns Manville 'Unfaced Formaldehyde-free Thermal and Acoustical Fiber Glass Insulation'.
    - .2 CertainTeed Insulation Canada Inc. 'Fibre Glass Building Insulation'.
    - .3 Knauf Insulation 'EcoBatt'.
- .5 INS-21:
  - .1 Semi-rigid insulation board; steel stud type.
  - .2 Non-combustible mineral-fibre to to CAN/ULC S702-09, Type 1, and to CAN/ULC-S114-05, 32 kg/m<sup>3</sup> (2 lb/ft<sup>3</sup>) minimum density to ASTM C167 for basalt rock and steel slag mineral-fibre insulation.
  - .3 Basis of design:
    - .1 Rockwool' ComfortBatt'.
- .6 INS-22:
  - .1 Semi-rigid insulation board; cavity wall type.
  - .2 Mineral-fibre to CAN/ULC S702-09, Type 1.
    - .1 Dual density:
      - .1 Outer layer: 100 kg/m<sup>3</sup> (6.25 lb/ft<sup>3</sup>) to ASTM C612-10.
      - .2 Inner layer: 65 kg/m<sup>3</sup> (4.1 lb/ft<sup>3</sup>) to ASTM C612-10.
    - .2 Mono density:
      - .1 96 kg/m<sup>3</sup> (6.0 lb/ft<sup>3</sup>) to ASTM C612-10.
  - .3 Acceptable *Products*:
    - .1 Johns Manville 'Cladstone Water & Fire Block Insulation – 6.0 PCF'.
    - .2 Owens Corning 'Thermafiber RainBarrier HD'.
    - .3 Rockwool 'CavityRock'.
- .7 INS-40:

## Thermal Insulation

---

- .1 Foamed-in-place (gap filler) insulation.
- .2 One-component CFC-free polyurethane foam to CAN/ULC S710.1-11.
- .3 Two-component CFC-free polyurethane foam to CAN/ULC S711.1-11.

### 2.2 Accessories

- .1 Insulation mechanical fasteners: HDPE washer, zinc plated pin finish, pins purpose made to suit substrate material, 50 mm (2") insulation holding diameter; direct fasten type, washer depth length to suit insulation thickness.
  - .1 Acceptable *Products*:
    - .1 Hilti 'X-IE'.
    - .2 ITW InsulFast Fastener.
    - .3 Substitutions: in accordance with Section 01 25 00.
  - .2 Adhesive: solvent based polymer modified liquid applied membrane, compatible with insulation to be applied, type as manufactured for the attachment of insulation.
    - .1 Basis of design: Bakor Airbloc 21 or 230-21.
  - .3 Concrete faced insulation fasteners and clips: corrosion resistant type as recommended by manufacturer, sized to suit application.
  - .4 Batt insulation wire mesh restraint; locations where insulation is not sandwiched by sheet metal or board materials: Zinc coated woven wire and mechanical fasteners.

## PART 3 - EXECUTION

### 3.1 Installation – General

- .1 Install insulation in accordance with manufacturer's installation instructions 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.
- .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.

## Thermal Insulation

---

- .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 – Below-Grade Insulation

- .1 On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
- .2 On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- .3 Concrete faced below grade perimeter foundation insulation:
  - .1 Install concrete faced insulation using corrosion resistant concrete fasteners and clips, required clips in accordance with manufacturer's written recommendations.
  - .2 Extend panels to minimum 150 mm (6") below finished grade unless otherwise indicated.
  - .3 Layout concrete faced insulation boards to maximize board sizes. Do not use boards less than 305 mm (12") wide. Orient boards vertically.
  - .4 Apply sealant around penetrations in accordance with Section 07 92 00.

### 3.3 Installation – Rigid Insulation Application

- .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.

### 3.4 Installation – Batt Insulation

- .1 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .2 Install batt insulation to fill cavity unless otherwise indicated.
- .3 Trim insulation to provide close-fit contact to framing assemblies and fill the required cavity or insulation assemblies to thicknesses specified or indicated.
- .4 Do not over compress or pack insulation to fit into spaces; maintain density to be consistent with the density of the uncompressed batt product.
- .5 Cut insulation to provide close-fit contact around electrical boxes, pipes, and other obstructions and penetrations through and within assemblies.
- .6 Secure insulation in such a manner that it will not sag or settle away from required locations.
- .7 Install continuous woven wire restraint mechanically fastened to steel studs to hold insulation against exterior sheathing materials.
- .8 Place insulation equal to that indicated for applicable assembly in jamb and header assemblies that will be inaccessible after their installation into wall.

### 3.5 Installation – Semi-Rigid Insulation

- .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.

Thermal Insulation

---

**3.6 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.
- .2 Install two-component foam to locations where indicated, in accordance with CAN/ULC S711.2-11 application standard.

**3.7 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00.
  - .1 *Contractor* shall:
    - .1 Verify insulation work is complete prior to covering.
    - .2 Perform inspection of completed work.
    - .3 Perform thickness verification.
  - .2 Do not cover insulation until it has been reviewed and accepted by the *Consultant*.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

**3.8 Protection**

- .1 Comply with manufacturer's printed recommendations 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**

## Insulation Types Schedule

---

### **PART 1 – GENERAL**

#### **1.1 General Notes**

- .1 Read in conjunction with the following Sections:

- 07 21 00 – Thermal Insulation
- 07 46 16 – Aluminum Panel Cladding Systems
- 07 46 19 – Metal Cladding Systems
- 07 54 19 – PVC Roofing
- 08 44 00 – Aluminum-Framed Glazing Systems
- 09 29 00 – Gypsum and Cement Board
- 09 78 13 – Metal Interior Panelling

#### **1.2 Scope**

- .1 Reference drawings for insulation locations and thicknesses.

### Insulation Types Schedule

#### 1.3 Schedule

Type	Description	Specifications Section(s)	Locations
	<b>Thermal insulation for foundation and below grade applications</b>		
<b>INS-10</b>	Rigid XPS insulation board (regular strength).	07 21 00	Below grade vertical applications.
<b>INS-10(40)</b>	Rigid XPS insulation board (high load 40).	07 21 00	Below concrete slab on grade horizontal applications.
	<b>Thermal insulation wall and soffit applications</b>		
<b>INS-20</b>	Batt insulation.	07 21 00	Miscellaneous locations where indicated.
<b>INS-21</b>	Semi-rigid mineral-fibre insulation batt (steel stud type)	07 21 00 07 46 16 07 46 19	Wind bearing metal stud and metal framed wall assemblies.
<b>INS-22</b>	Semi-rigid dual density mineral-fibre insulation board (cavity wall type).	07 21 00 07 46 16 07 46 19	Rain screen and cavity wall assemblies.
	<b>Miscellaneous applications:</b>		
<b>INS-40</b>	Foamed-in-place (gap filler) insulation	07 21 00	Gap filler around mounting brackets, windows, curtain wall, penetrations, etc.
	<b>Thermal insulation for roof systems:</b>		
<b>INS-51</b>	Rigid polyisocyanurite insulation board.	07 54 19	PVC roof assemblies.
	<b>Acoustic insulation for interior assemblies:</b>		
<b>INS-60</b>	Mineral-fibre sound attenuation batts.	09 29 00	Gypsum board partitions.
<b>INS-61</b>	Reserved.		
<b>INS-62</b>	Glass fibre sound attenuation board and blanket.	09 78 13	Acoustic metal panel wall assemblies – alternate product.

**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.

### 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* to be for used in the work of this section.
- .3 Samples:
  - .1 Submit sample of proposed *Products* for review by *Consultant*.
- .4 Manufacturer's instructions:
  - .1 Submit manufacturer's *Product* installation instruction for *Products* to be used in the work of this section.
- .5 Vapour barrier test results and certification:
  - .1 Provide certification prepared by accredited testing company for test procedures listed in Table 1 and paragraphs 7.1.2, 7.1.3, 7.1.4, and 7.1.5 of ASTM E1745-11, providing for each test, the date of the most recent test, and the test results.
    - .1 Accompany certification letter 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.

### 1.4 Quality Assurance

- .1 Qualifications: Provide work of this section, executed by competent installers with experience 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 \*m<sup>2</sup>)(0.010 perms (gm/ft<sup>2</sup>/in-Hg)) to ASTM E1745-11 paragraphs 7.1.2 through 7.1.5.
    - .2 Strength: Class A to ASTM E1745-11.
    - .3 Thickness of plastic:

Below-Grade Vapour Barrier

---

- .1 0.38 mm (15 mils) minimum.
- .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 Description: High density polyethylene tape, pressure sensitive, 100 mm (4") wide, product as per vapour barrier membrane manufacturer's installation instructions.
- .3 Penetration flashing:
  - .1 Vapour barrier membrane material and vapour barrier joint tape in accordance with manufacturer's instructions.

### **PART 3 - EXECUTION**

#### **3.1 Installation**

- .1 Install vapour barrier membrane in accordance with manufacturer's instructions and ASTM E1643-11.
- .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, repairs shall be made. 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.

### **3.2 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00.
  - .1 Do no cover below-grade vapour barrier until it has been reviewed by *Consultant*.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Sheet-Applied Self-Adhesive Air / Vapour Barrier Membrane.
  - .2 Liquid-Applied Air / Vapour Barrier Membrane.
  - .3 Sheet Applied Heat Fused Air / Vapour Barrier Membrane.
  - .4 Sheet Metal Air/Vapour Barrier.

### **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.
- .4 Samples:
  - .1 Submit 305 mm (12") square samples of each type of air barrier membrane.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 *Provide* the work of this section, executed by competent installers with experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-up:
  - .1 Construct minimum 10 m<sup>2</sup> (100 ft<sup>2</sup>) area of each typical wall assembly installation for each type of *Product*.
  - .2 Locate at the *Place of the Work* as part of final installation. Space installation to include exterior wall panel incorporating window, glazing system and insulation.
  - .3 Do not proceed until mock-up has been reviewed by *Consultant*.

Air Barrier Systems

---

### 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.
- .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 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 cladding 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.m<sup>2</sup> at 75 Pa (0.004 cfm/ft<sup>2</sup> at 1.57 psf) to ASTM E2178-13.
  - .2 Rate of air leakage of air barrier system: Maximum 0.15 L/s.m<sup>2</sup> at 75 Pa (0.030 cfm/ft<sup>2</sup> at 1.57 psf) to ASTM E283-04(2012).
  - .3 Water vapour transmission for air / vapour barriers: Maximum 5.7 ng/Pa.m<sup>2</sup>.s. (0.1 perms).

### Air Barrier Systems

---

- .4 Water vapour transmission for vapour permeable air vapour barriers: Minimum 570 ng/Pa.m<sup>2</sup>.s. (10 perms).
  - .5 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.
  - .6 Low temperature performance: Minimum -30°C (-22°F).
  - .7 Compatibility: Air barrier system materials shall be compatible with substrate and adjacent materials with material manufacturers and show no performance deterioration during service conditions.
  - .8 Self-sealability: ASTM D1970/D1970M-16.
  - .9 Adhesion: ASTM D4541-09e1, 110 kPa (16 psi) minimum performance for site tested adhesion.
- .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 / Vapour 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. Coordinate with Section 04 05 23.
  - .2 Thickness: 1.0 mm (40 mils).
  - .3 Application temperature: in accordance with product installation instructions.
  - .4 Primer: in accordance with product installation instructions.
  - .5 Termination and penetration sealing mastic: in accordance with product installation instructions.
  - .6 Acceptable product systems:

### Air Barrier Systems

---

- .1 Henry Company 'Blueskin SA' and 'Blueskin SA LT'.
- .2 Carlisle Coatings & Waterproofing 'CCW 705'.
- .3 Grace Construction Products 'Perm-A-Barrier Wall Membrane'.
- .4 IKO 'AquaBarrier AVB' and AquaBarrier AVB Low Temp'.
- .5 Soprema 'Soprasedal Stick 1100 Summer Grade' and Soprasedal Stick 1100 Winter Grade'.
- .6 Tremco 'ExoAir 110 and 110LT'.
- .7 W.R. Meadows 'Air Shield' and 'Low Temperature Air Shield'.

#### **2.4 Liquid-Applied, Air / Vapour Barrier Membrane System (Elastomeric)**

- .1 One component elastomeric, fluid-applied membrane.
- .2 VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- .3 Provide joint reinforcement mesh to substrate panel substrates and joints/gaps in substrate materials.
- .4 Concrete and concrete masonry patching materials; for crack, protrusions, voids, offsets, and irregularities: as per manufacturer's printed installation instructions.
- .5 Transition air barrier membrane; details, protrusions, transitions between dissimilar substrate materials, and gaps 6 mm (1/4") and greater: Preformed membrane per manufacturer's printed installation instructions.
- .6 Acceptable *Product* systems:
  - .1 BASF Construction Systems 'Enershield-I'.
  - .2 Carlisle Coatings & Waterproofing 'Barriseal'.
  - .3 Henry 'Air-Bloc 32MR'.
  - .4 Soprema 'Soprasedal LM 200'.
  - .5 Tremco 'ExoAir 120'.
  - .6 W.R. Meadows 'Air-Shield LM'.

#### **2.5 Sheet Applied, Heat Fused Air / Vapour Barrier Membrane System**

- .1 Description: Heat fused preformed modified membrane system consisting of SBS modified asphalt for low temperature flexibility and polyester scrim reinforcing.
- .2 Primer: for cast-in-place concrete substrate and as required by manufacturer's installation instructions.
- .3 Air barrier membrane thickness: 2.2 mm (86 mils) minimum.
- .4 Termination mastic: Rubberised asphalt-based mastic with 200 g/l max. VOC content, as recommended by manufacturer of air barrier sheet membrane.
- .5 Acceptable *Product* systems:
  - .1 Henry 'Blueskin TG'.
  - .2 Soprema 'Soprasedal 180 HD F/F'.

Air Barrier Systems

---

**2.6 Sheet Metal, Air/Vapour Barrier**

- .1 Sheet metal for metal/air vapour barriers and air seals: Minimum 22 gauge thick, sheet steel galvanized to ASTM A653/A653M-11 , Designation G90/Z275.
- .2 Sealant for sealing of metal air/vapour barrier: Single component silicone, to ASTM C920-11, Type M or S, Grade NS, Class 25.
- .3 Dielectric Separator: Best grade, quick drying non-staining alkali resistant bituminous paint to CAN/CGSB 1.108-M89.
- .4 Fasteners: Self-drilling, galvanized steel fasteners with neoprene washers.

**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 installation instructions to construction, control, and expansion joints, across junctions between different building assemblies, and around penetrations through the building assembly.
- .3 At movement joints and locations where back side of membrane is exposed to air gaps loop membrane into opening to allow for movement. Provide polyethylene film or other approved material to the substrate face of the membrane loop in accordance with manufacturer's installation instructions and written recommendations.
- .4 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.

**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 recommendations and written instructions. Stagger vertical joints 200 mm (8").
- .2 Align and position self-adhering membrane, remove protective film and press firmly into place. Ensure minimum 50 mm (2") overlap at end and side laps. Promptly roll laps and membrane with a counter top roller to affect the seal.
- .3 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.
- .4 Seal projections with application of liquid air seal mastic.
- .5 Apply self-adhering membrane continuous across junctions between different building assemblies, and around penetrations through the building assembly. Provide 100 mm (4") overlap unless otherwise indicated, or required by manufacturer's installation instructions.

## Air Barrier Systems

---

- .6 Inspect membrane for punctures, misaligned seams and fishmouths, apply additional layer of membrane over affected area, extending minimum of 150 mm (6") beyond damaged area in all directions.

### **3.3 Installation – Liquid-Applied Membrane**

- .1 Install membrane in accordance with manufacturer's printed instructions:
- .2 Material must be applied continuously over surface at the required thicknesses. Use multiple, overlapping passes.
- .3 For gaps in substrate up to 3 mm (1/8") wide: Fill with liquid applied membrane and tape with joint reinforcement mesh and allow to cure prior to the full application of the liquid membrane to the surface.
- .4 For gaps in substrate larger than 3 mm (1/8") wide and dynamic joints: apply preformed membrane as directed, fully embed preformed membrane flashing, overlapping area a minimum of 100 mm (4") on either side and top dress edges with an additional coat of material.
- .5 Transition air barrier membrane (preformed membrane):
  - .1 Apply primer to substrate for preformed membrane work.
  - .2 Lap preformed membrane 75 mm (3") minimum to substrates, both sides of joint between dissimilar substrate materials.
  - .3 Overlap transition with preformed membrane minimum 25.4 mm (1") unless otherwise indicated in manufacturer's installation instructions.
  - .4 Wrap openings with transition membrane flashing returning to inside face of stud or masonry openings unless otherwise indicated.

### **3.4 Installation – Sheet Applied, Heat Fused Membrane**

- .1 Apply membrane continuous to prepared and primed substrate in an overlapping shingle fashion to shed moisture towards exterior and in accordance with manufacturer's recommendations and written instructions. Stagger vertical joints 200 mm (8").
- .2 Position air barrier membrane for alignment and apply heat to the underside of the membrane by propane torch at the point of contact with the substrate.
- .3 Apply sufficient heat to make bitumen tacky and firmly press membrane onto substrate to ensure complete contact and bond for the full extent of the membrane.
- .4 Overlap sides and ends a minimum of 50 mm (2") and use a heated trowel to fully seal laps.
- .5 Seal projections, using a heated trowel to butter membrane at the interface with projection.

### **3.5 Installation – Sheet Metal Air /Vapour Barrier**

- .1 Apply sheet metal in an overlapping shingle fashion, staggering vertical joints. Form 10 mm (3/8") x 45 degree lips at lap joints and terminations and fill with sealant.
- .2 Overlap sides and ends of sheet a minimum of 50 mm (2").
- .3 Mechanically fasten sheet metal to supports at 200 mm (8") on centre.

---

Air Barrier Systems

---

- .4 Ensure all projections, including wall ties, are properly sealed by using liquid applied air barrier membrane.
- .5 Air barrier membrane to be complete and continuous from the wall to the roofing membrane system and waterproofing membrane system, around windows, aluminum screens, hollow metal door frames and spandrel panels.

**3.6 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00.
  - .1 Independent inspection and testing company shall perform inspection of completed work.
  - .2 Perform pull adhesion tests for project substrates in accordance with ASTM D4541-09e1.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

**END OF SECTION**

Aluminum Panel Cladding System

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes aluminum panel cladding at:
  - .1 Exterior locations.
  - .2 Jambs of high/large windows in Aquatic Hall.
  - .3 Vestibule wall W4B.
  - .4 Ceiling in Aquatic Hall above high/large window to pool from lobby.

### **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 methods to achieve watertight assembly, including sealants, penetration seals, drainage path of moisture from within assembly to exterior of envelope.
  - .4 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 1 - 610 x 610 mm (24" x 24") size sample of each type of typical corner condition and panel joint.

Aluminum Panel Cladding System

---

## 1.4 Quality Assurance

### .1 Qualifications:

- .1 Installers / applicators / erectors: Execute the work of this section only by a *Subcontractor* who has adequate plant, roll forming machinery, 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 Aspects of the work of this section are required to be prepared by a professional engineer. Refer to Section 01 33 00 for specific details and requirements in this regard.

### .2 Mock-up:

- .1 Construct panels 10 m<sup>2</sup> (100 ft<sup>2</sup>) of typical wall cladding installation. Locate on site as part of final installation.
- .2 Do not proceed until mock-up has been accepted by *Contractor*, *Consultant* and cladding inspection company.

## 1.5 Delivery, Storage, and Handling

- .1 Store materials at temperatures recommended by manufacturer.
- .2 Store roll materials on end.
- .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 manufacturer's instructions.

## 1.7 Extended Warranty

- .1 Special product warranty; aluminum finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - .1 Failures to paint finish include, but are not limited to, the following:
    - .1 Colour fading more than 5 Hunter units when tested according to ASTM D2244-16.
    - .2 Chalking in excess of a No. 8 rating when tested according to ASTM D4214-07(2015).
    - .3 Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - .2 Warranty period: 20 years.

Aluminum Panel Cladding System

---

## PART 2 – PRODUCTS

### 2.1 Performance/Design Requirements

#### .1 Design:

- .1 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.
- .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.
  - .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 Metal fasteners shall be corrosion resistant.
  - .2 *Provide* drip detail over windows and door heads, copings, at edges of overhangs, to direct moisture to exterior.
  - .3 Wall system to utilize drain systems to positively drain water from within wall system to exterior.

Aluminum Panel Cladding System

---

## 2.2 Materials – Panel System

- .1 System types:
  - .1 Concealed fastener with dry joints.
- .2 Aluminum panels; aluminum flat sheet; solid type:
  - .1 Aluminum flat sheet: Aluminum flat sheet to ASTM B209-14, 3.2 mm (0.125") thick panels in the following alloy:
    - .1 Painting quality: 3003-H14 or 3105-H14 to ANSI H35.1/H35.1M-2013.
  - .2 Basis of design: Ontario Panelization 'System Family #5'.
- .3 Extruded aluminum accessory components:
  - .1 Aluminum extrusions to ASTM B221-14, to the following minimum wall thickness and alloy:
    - .1 Thickness:
      - .1 2.28 mm (0.090").
    - .2 Alloy: 6063-T52.
- .4 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.
- .5 Fasteners: Self-tapping, purpose made stainless steel screws.
- .6 Insulation:
  - .1 Semi-rigid insulation: in accordance with Section 07 21 00.
- .7 Air barrier membrane: in accordance with Section 07 27 00.
- .8 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-11, Grade A.
  - .3 Z-girt shall be prepainted black for added corrosion resistance.
  - .4 Thermally broken spacer systems:
    - .1 Subject to compliance with the requirements of the *Contract Documents*, provide one of the following product systems:
      - .1 Engineered Assemblies 'T-Clip Thermally Broken Façade Substructure'.
      - .2 Exterior Technologies Group 'TAC System Thermal Spacer'.

Aluminum Panel Cladding System

---

.3 Cascadia Windows & Doors 'Cascadia Clip'.

- .9 Isolation coating: Bituminuous paint.
- .10 Trim, coping, closures, and cap pieces:
  - .1 3.18 mm (0.125") aluminum, to match cladding system.
  - .2 Factory fabricate components, ready for installation.
- .11 Sealant: in accordance with Section 07 92 00.

**2.3 Finishes**

- .1 Exposed aluminum surfaces: 70% Kynar 500 or Hylar 5000 fluoropolymer resin systems, ceramic pigments and other select inorganic pigments to AAMA 2605-13.
  - .1 Acceptable *Products*:
    - .1 PPG 'Duranar XL'.
    - .2 Valspar 'Fluorpon Classic'.
    - .3 Substitutions: in accordance with Section 01 25 00.
  - .2 Colours:
    - .1 White.
    - .2 Black.

**2.4 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.
- .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 paint grain finish. Mark direction of metal grain and paint application on back of panels.

**2.5 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:

Aluminum Panel Cladding System

---

- .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.

### **3.2 Air Barrier Membrane Application**

- .1 Install in accordance with Section 07 27 00 and manufacturer's installation instructions.
- .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 Carefully cut and fit insulation in pieces to fit surfaces of members to which insulation bears contact.

---

Aluminum Panel Cladding System

---

- .2 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.
- .3 Apply insulation to ensure total and complete coverage of surfaces indicated to be insulated, and in direct contact with such surfaces.
- .4 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**

- .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.
- .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.

Aluminum Panel Cladding System

---

- .15 Protect surface of metals in contact with concrete, mortar, plaster or other cementitious surface with isolation coating.

### 3.5 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.
    - .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.

### 3.6 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and the following:
  - .1 Thermal insulation: in accordance with Section 07 21 00.
  - .2 Air barrier systems: in accordance with Section 07 27 00.

### 3.7 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.

Aluminum Panel Cladding System

---

**3.8 Protection**

- .1 Protect panels during fabrication, transportation, storage at the *Place of the Work* and erection.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Prefinished metal cladding system.

### **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 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 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 samples complete with manufacturer's labels intact, of materials to be used for work of this section prior to commencement of work. Allow ample time for review and acceptance by *Consultant* and independent inspection and testing company. Do not proceed with work until samples are accepted.
  - .2 Submit 2 - 610 mm x 610 mm (24" x 24") size samples of cladding materials, of each colour and profile specified.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Manufacturers: Company specializing in manufacturing the *Products* specified in this section, with minimum 10 years experience.

## Metal Cladding Systems

---

- .2 Installers / applicators / erectors: 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 Mock-ups:
  - .1 Before proceeding with final purchase of materials and fabrication of metal cladding components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements.
  - .2 Install mock-up at location directed by *Consultant*. Retain accepted mock-up as quality standard for acceptance of completed metal cladding.
  - .3 *Provide* mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and colour.

### 1.5 Closeout Submittals

- .1 Closeout submittals: Submit in accordance with Section 01 77 00.
- .2 Operation and maintenance data: Submit manufacturer's maintenance instructions for incorporation into the operation and maintenance manuals.

### 1.6 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.

### 1.7 Field Conditions

- .1 Comply with CSSBI's installation instructions and recommendations.

## PART 2 - PRODUCTS

### 2.1 General

- .1 Single source responsibility: obtain components of metal wall cladding 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 Design to CAN/CSA S136-07 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.

### Metal Cladding Systems

---

- .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.
- .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.
- .8 Design system to meet tolerances specified.

## 2.3 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-11 with coating designation Z275 (G90) to ASTM A924/A924M-16ae1 unless otherwise indicated.
    - .1 Preformed metal thickness: 0.76 mm (22 gauge) base steel nominal thickness.
  - .2 Accessories and hardware: Zinc coated steel to meet specified requirements of CAN/CSA G164-M92, hot dip galvanized after fabrication.
  - .3 Basis of design profile: Vicwest 'Tradition 100' standing seam system.
- .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-11, Grade A.

Metal Cladding Systems

---

- .3 Z-girt shall be prepainted black for added corrosion resistance.
- .4 Thermally broken spacer systems:
  - .1 Subject to compliance with the requirements of the *Contract Documents*, provide one of the following product systems:
    - .1 Engineered Assemblies 'T-Clip Thermally Broken Façade Substructure'.
    - .2 Exterior Technologies Group 'TAC System Thermal Spacer'.
    - .3 Cascadia Windows & Doors 'Cascadia Clip'.
- .3 Sub-girts (z-girts): minimum 1.2 mm (18 gauge) zinc-coated steel to ASTM A653/A653M-11 with Grade A coating Z275.
  - .1 Adjustable.
  - .2 Thermal breaks at structural steel substrates: 3 mm (1/8") thick natural cork or neoprene.
- .4 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.
- .5 Waterproofing underlayment membrane: High temperature grade for use at locations where membrane is not protected by insulation:
  - .1 Description:
    - .1 Thickness: 1.27 mm (50 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 minimum.
  - .2 Acceptable *Products*:
    - .1 Henry 'Blueskin PE 200 HT'.
    - .2 Grace 'Ultra'.
    - .3 Soprema 'LASTOBOND SHIELD HT'.
- .6 Insulation: INS-22 as specified in Section 07 21 00.
- .7 Sheet-applied vapour impermeable self-adhesive air/vapour barrier membrane system: in accordance with Section 07 27 00.
- .8 Exposed sealants: in accordance with Section 07 92 00.
- .9 Gaskets: soft, pliable, cold weather grade, PVC foam, extruded profile for outer sheet.
- .10 Fasteners:
  - .1 Self-drilling, Type 304 stainless steel.
  - .2 Head finish:
    - .1 Type 304 stainless steel, in concealed locations.

## Metal Cladding Systems

---

- .2 Prepainted metal, colour to match prefinished metal panels in exposed locations.
- .3 Nylon head, colour to match prefinished metal panels in exposed locations.

### 2.4 Metal Finishes

- .1 Prefinished sheet finish:
  - .1 Painted finish: factory prefinished Metallic Series (4 coat PVDF).
    - .1 Metallic Series (Polyvinylidene Fluoride - PVDF) will not visibly (within 10 metres to the unaided naked eye) crack, chip, or peel (lose adhesion) for thirty-five (35) years from date of application. This does not include minute fracturing that may occur during the normal fabrication process. Metallic Series (Polyvinylidene Fluoride - PVDF) will not chalk in excess of a number eight (8) rating, in accordance with ASTM D-4214-98 method D659 at any time for thirty (30) years; will not change colour more than five (5.0) Hunter  $\Delta E$  units as determined by ASTM method D-2244-02 at any time for thirty (30) years.
  - .2 Colour: custom metallic colour to later selection by *Consultant*.

### 2.5 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.
- .11 Lay out panels to obtain uniform metal and paint grain finish. Mark direction of metal grain and paint application on back of panels.
- .12 For siding profiles applied horizontally, V-notch, mitre, and seal exterior corners where siding changes direction.

## **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 installation instructions 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.
- .6 Seal around materials penetrating membrane in accordance with manufacturer's printed installation instruction.

### **3.3 Waterproofing/Air Barrier Underlayment Membrane**

- .1 Prime substrates and install membrane in accordance with membrane manufacturer's written installation instructions.
- .2 Installed 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.
- .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, 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.

## Metal Cladding Systems

---

### 3.4 Insulation

- .1 Install insulation in accordance with manufacturer's installation instructions 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.

### 3.5 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.
- .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.

## Metal Cladding Systems

---

- .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 Do not install component parts that are observed to be defective, including warped, bowed, dented, and broken members.
- .16 Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.
- .17 Protect surface of metals in contact with concrete, mortar, plaster or other cementitious surface with isolation coating.

### 3.6 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.

### 3.7 Field Quality Control

- .1 Quality control to be in accordance with Section 01 45 00.
  - .1 Inspection and testing company shall:
    - .1 Perform inspection of completed work.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.
  - .1 Manufacturer's field representative shall provide at no additional cost to the Owner, a minimum of three scheduled field inspections which shall include a written report from the panel manufacturer during pre-installation, upon 50% completion, and upon final completion of metal cladding installation.

### 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 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.

Metal Cladding Systems

---

**3.9 Protection**

- .1 Protect prefabricated steel during fabrication, transportation, storage at the *Place of the Work* and erection, in accordance with CSSBI Standards.

**END OF SECTION**

Wood Soffits

---

## **PART 1 - GENERAL**

### **1.1 Summary**

.1 Section includes:

- .1 Wood soffits.

### **1.2 Administrative Requirements**

.1 Coordination

- .1 Coordinate with installation of air barrier membrane, under Section 07 27 00, and insulation, under Section 07 21 00, to ensure complete continuity of air barrier and thermal barrier system for building.

.2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

### **1.3 Quality Assurance**

.1 Qualifications:

- .1 Installers / applications / erectors: Execute the work of this section only by a *Subcontractor* meeting the following qualifications:

- .1 Has adequate plant, equipment, and skilled workers to perform it expeditiously.
- .2 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 Mock-ups:

- .1 Construct 10 m<sup>2</sup> (100 ft<sup>2</sup>) area of typical installation for acceptance, in location as directed by *Consultant*. Locate at the *Place of the Work* as part of final installation.
- .2 Mock-up shall incorporate siding, finishing accessories and adjacent materials including flashing and trim.

### **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 Data sheets on each product to be used, including:

- .1 Preparation instructions and recommendations.
- .2 Storage and handling requirements and recommendations.
- .3 Installation methods.

.3 Shop drawings:

- .1 Submit engineered shop drawings.

#### Wood Soffits

---

- .2 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 Samples:
  - .1 Submit duplicate full size samples of siding and trim material, complete with specified finish and profile specified.
  - .2 Selection Samples: For each finished product specified, 2 complete sets of colour chips representing manufacturer's full range of available materials and finished appearance.
  - .3 Verification Samples: For each finish product specified, 3 samples, nominal size 140 mm (5-1/2 inches) square representing actual product with finished colour and texture.
  - .4 Submit samples of accessories if requested by *Consultant*.

### 1.5 Closeout Submittals

- .1 Submit required closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:
  - .1 Submit manufacturer's *Product* data sheets covering care and recommended maintenance procedures for the *Products* of this section for incorporation into the operation and maintenance manuals.

### 1.6 Delivery, Storage, and Handling

- .1 Package materials and identify on attached labels the manufacturer, grade, contents, weight as applicable, and product and specification numbers.
- .2 Acclimatize materials at the *Place of the Work*, to achieve and maintain optimum moisture content of wood products to siding manufacturer's written instructions.
- .3 Provide well ventilated storage for materials under opaque, breathable and waterproof tarpaulins or sheds. Provide moisture barrier under wood products and elevate siding minimum 150 mm (6") above floor or ground to allow air to circulate freely around and throughout the stack of lumber.
- .4 Handle materials carefully to preclude damage.
- .5 Keep materials free from dirt, oil, debris, ice, snow and contaminants.
- .6 Protect wood products during, transportation, site storage and erection.

### 1.7 Field Conditions

- .1 Do not install cladding during weather that might adversely affect the performance and appearance of the system.
- .2 Do not install materials over surfaces that are wet, icy, dirty or otherwise unacceptable to the system being installed.
- .3 Secure the work in a safe and watertight fashion before the onset of inclement weather and at the end of each day's work.

Wood Soffits

---

- .4 Provide protection to building surfaces during hoisting, or application of materials. Protect adjacent surfaces in an acceptable manner from damage, marking and soiling during installation of this work.

## **PART 2- PRODUCTS**

### **2.1 Materials**

- .1 Species: Eastern White Cedar.
  - .1 Grade: Standard 1.
  - .2 Tongue and groove.
  - .3 Good 1 face, 2 edges, sound tight knots, pencil size hole allowed, no surface rot, minimal wane and twists.
- .2 Slat sizes: 19 mm x 89 mm.
- .3 Plywood: in accordance with Section 06 10 53.
- .4 Gypsum board sheathing: in accordance with Section 09 29 00.
- .5 Fasteners:
  - .1 Material: No. 304 stainless steel.
  - .2 Type: Splitless Siding Nails.
  - .3 Length: Must be sufficient to penetrate solid wood a minimum of 32 mm (1 1/4").
- .6 Soffit vents: Custom configuration aluminum plate as indicated.
- .7 Soffit trims: where shown with no venting, supply and install similar configuration to match vented configuration. Finish for all soffit trims/extrusions to match finish of aluminum framed glazing systems in all respects in accordance with Section 08 44 00.
- .8 Strapping: Softwood lumber, kiln dried to 12 - 14%, pressure treated for moisture resistance, minimum 25 mm x 75 mm.
- .9 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.
- .10 Sub-girts (z-girts): minimum 1.2 mm (18 gauge) zinc-coated steel to ASTM A653/A653M-11 with Grade A coating Z275.
  - .1 Z-girts shall be adjustable where required to compensate of out-of-tolerance substrate conditions.
- .11 Fasteners:
  - .1 Wood cladding: T-304 stainless steel ring shank nails with barb-ringed shank and G-embossed head.
  - .2 Wood strapping: Buildex 'Climaseal' coated 'Teks' No. 8 screws.
  - .3 Z-girts: Buildex 'Climaseal' coated 'Teks' No. 8 screws.
- .12 Aluminum plate panels, including formed and bent copings, flashing and trims, fascia and soffit trim, sills at deck guards:

## Wood Soffits

---

- .1 Tempered, flattened aluminum sheet, AA-5005-H14, 3 mm thick minimum (unless otherwise indicated).
- .2 Reinforced with concealed supports.
- .3 Finish: to match finish aluminum framed glazing systems in all respects in accordance with Section 08 44 00.
- .13 Insulation: INS-22 in accordance with Section 07 21 00.
- .14 Air/vapour barrier membrane: in accordance with Section 07 27 00.
- .15 Exterior sheathing: in accordance with Section 09 29 00.
- .16 Metal stud framing: in accordance with Section 05 41 13.
- .17 Black metal insect screen.

### 2.2 Finishes

- .1 Water repellent, UV resistant, penetrating two coat finish.
  - .1 Basis of design:
    - .1 Sansin 'SDF' base coat and 'SDF' top coat.
  - .2 Color: to later selection by *Consultant*.

## PART 3- EXECUTION

### 3.1 Examination

- .1 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 which will adversely affect the performance of this work. Notify the *Consultant* of unsatisfactory conditions. Do not proceed with this work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of surfaces and conditions.
- .2 Verify that temperature and environmental conditions required by the siding manufacturer is suitable for installation of materials.
- .3 Do not commence installation until work of other sections that may damage the siding is complete.

### 3.2 Preparation

- .1 Install strapping at spacing in accordance with manufacturer's installation instructions.
- .2 Install metal flashings continuous at siding bottom ledges, sills, and over window and other openings. Lap ends and seal with sealant. Secure in position tight to wall sheathing.
- .3 Install siding starter strips.
- .4 Apply sealant around window, door, and other opening frames.
- .5 Coordinate work with related trades; scribe and cope siding boards for accurate fit. Allow installation of related work to avoid cutting and patching.
- .6 Select siding boards of longest possible lengths. Discard boards that are warped, twisted, bowed, crooked or otherwise defective.

Wood Soffits

---

**3.3 Installation**

- .1 Install siding and accessories in accordance with siding manufacturer's written instructions.
- .2 Siding must not be install over wet strapping. Use kiln dried strapping only. Allow rain soaked materials to dry prior to installation.
- .3 Install siding in straight aligned lengths, set level with plumb ends and corners. Spread the boards out on the wall surface in order to limit joints and cutting operations. Use long boards over and under windows as well as on large surfaces. Use short segments for small surfaces and for spaces located between doors and windows.
- .4 Cut butt joints at 45 degrees. Position cut ends over bearing surfaces. Apply sealant to cut ends to minimize weather entry and humidity.
- .5 Achieve siding joints no less than 800 mm (32") apart in adjoining boards and distribute evenly over wall surface.
- .6 Install trim over external and internal corners.
- .7 Install corner strips, closures, fascia boards, frieze boards, skirt boards, and trim and as detailed on drawings.
- .8 Fasten strapping securely to metal framing at 400 mm (16") on centre spacing to manufacturer's written instructions.
- .9 Fasten siding securely to wood substrate; ensure minimum 32 mm (1-1/4") nail penetration into solid substrate.
- .10 Conceal fasteners.
- .11 Caulk nail head prior to site finishing.
- .12 Seal windows, doors and any protrusions through siding and trim neatly with sealant.
- .13 Seal end cuts and other pressure-treated wood exposed during installation with pressure-treatment sealer as recommended by finish manufacturer.

**3.4 Adjusting and Cleaning**

- .1 After installation is completed, clean to remove dirt, dust and foreign materials in accordance with manufacturer's instructions.
- .2 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 PVC roofing membrane, fully adhered with profile battens.
  - .2 Cover board, fully adhered.
  - .3 Rigid polyisocyanurate insulation,
    - .1 Top level: fully adhered
    - .2 Bottom level: mechanically fastened.
    - .3 Tapered insulation where indicated.
  - .4 Air/vapour barrier Membrane, self-adhered.
  - .5 Sheathing board, mechanically fastened.

### **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 instructions.
  - .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.

Polyvinyl-Chloride (PVC) Roofing

---

- .8 Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
- .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 *Products* proposed for use in the work of this section.
- .3 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.
- .4 Shop drawings; general details:
  - .1 Submit shop drawings indicating fastening locations.
  - .2 Submit drawings showing locations of main joints, section of entire system, sections of each sleeve and penetration condition, flashing conditions, expansion joints and other fabrication information. Indicate layout of membrane fasteners.
  - .3 Include plans, elevations, sections, details, and attachments to other work.
    - .1 Base flashings and membrane terminations.
    - .2 Roof plan showing orientation of roof deck and orientation of membrane roofing.
    - .3 Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
- .5 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 independent inspection and testing company. Do not proceed with work until samples are accepted.
  - .2 Submit following samples, prior to ordering materials:

Polyvinyl-Chloride (PVC) Roofing

---

- .1 Typical hot weld joint in 450 mm (18") long sample and 305 mm (12") square of each type of roofing material showing materials and colours.

.6 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.

**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: 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.
    - .1 Work of this section shall be installed by a *Subcontractor* that is a member in good standing of the Canadian Roofing Contractors Association (CRCA).
    - .2 *Subcontractor* must be trained and approved by membrane manufacturer. Submit *Subcontractor's* (including full-time site supervisor responsible for the roofing work on site) certification letter prepared by membrane manufacturer.
      - .1 Heat welding of laps shall be performed only by skilled welders who have successfully completed a course of instruction provided by membrane manufacturer.

**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 instructions 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 or overloading of structure.

Polyvinyl-Chloride (PVC) Roofing

---

- .4 Handle materials to preclude damage or deterioration. 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*.
- .9 Protect edges of roll goods from damage during handling, and store rolls on end to prevent flattening.

## 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 instructions and warranty requirements.

## 1.8 Extended Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36.
- .2 Roofing manufacturer shall provide total system warranty including the following:
  - .1 Roofing membrane manufacturer will issue a written document in the *Owner's* name, valid for duration listed below, for the repair of leaks in the roofing membrane to restore the roofing system to dry and watertight condition, to the extent that membrane manufacturing or installation defects caused water infiltration.
  - .2 Warranty shall cover entire cost of the repair(s) required to maintain dry and watertight roofing system during the full warranty duration.
  - .3 Warranty shall include for labour, materials, and installation quality.
  - .4 Warranty shall be non-prorated with no dollar limit (NDL) for duration of warranty.
  - .5 Membrane manufacturer shall review installation of base ply prior to application of cap sheet.
  - .6 20 year warranty duration.

## PART 2 – PRODUCTS

### 2.1 Manufacturers

- .1 Basis of design:
  - .1 Sika Sarnafil.
- .2 Acceptable alternate roofing system manufacturers, subject to compliance with requirements of the *Contract Documents* including non-nominal membrane thickness:
  - .1 Carlisle Syntec.

Polyvinyl-Chloride (PVC) Roofing

---

.2 Duro-Last.

## 2.2 Performance/Design Requirements

- .1 The roofing system shall include roofing system materials required to achieve roofing membrane manufacturer's warranty.
- .2 Roofing system shall resist environmental and wind (uplift) loads, normal movement of structure, and effects of those loads in accordance with the building code and the following:
  - .1 Roofing system assemblies shall have been successfully tested by a qualified testing agency to resist project roofing uplift pressures in accordance with the building code.
    - .1 CSA A123.21 compliant roof assembly with respect to wind uplift resistance.
    - .2 Wind uplift pressures: as indicated on structural drawings.
  - .2 Movement within roofing system, and between roofing system and building structure.
- .3 Material compatibility: Provide roofing system materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.
- .4 Roofing system: Prevent water from entering building and roofing assembly through roofing membrane.
- .5 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".
- .6 Fire resistance: The roof assembly shall meet the conditions of acceptance of CAN/ULC-S126-06.
- .7 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 m<sup>2</sup> at 75 Pa (0.004 cfm/ft<sup>2</sup> at 1.57 psf) to ASTM E2178-13.
  - .2 Rate of air leakage of air barrier system: Maximum 0.15 L/s m<sup>2</sup> at 75 Pa (0.030 cfm/ft<sup>2</sup> at 1.57 psf) to ASTM E283-04(2012).
  - .3 Water vapour transmission for air / vapour barriers: Maximum 5.7 ng/Pa.m<sup>2</sup>.s. (0.1 perms).
  - .4 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.
  - .5 Low temperature flexibility: to -30°C (-22°F) to CGSB 37-GP-56M-1985.
- .8 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:

Polyvinyl-Chloride (PVC) Roofing

---

- .1 Walls and openings.
- .2 Across construction, control, and expansion joints.
- .3 Penetrations.

## 2.3 Materials

- .1 Single ply premoulded membrane:
  - .1 Feltback fibreglass reinforced polyvinyl chloride sheet, with lacquer dirt repellent coating: ASTM D4434/D4434M-15, Classification Type II, Grade I.
    - .1 Adhered membrane:
      - .1 Basis of design:
        - .1 Sarnafil 'G410', 1.5 mm (60 mils) thick minimum, non-nominal.
      - .2 Membrane colours:
        - .1 Colour: to later selection by *Consultant*.
      - .3 Membrane interply reinforcement: as recommended by manufacturer to suit installation and attachment methods. Roofing shall be mechanically fastened, and fully adhered at required locations.
    - .2 Installed membrane system shall allow for structural movement or deflection of building, and span cracks in substrate of 6 mm (1/4") wide or less which may occur after installation of membrane.
    - .3 Elastic sheet materials shall be compatible with other materials used to provide the complete system including adhesives, insulation, protection materials and expansion joints.
  - .2 Cover board:
    - .1 Factory primed glass mat faced exterior grade gypsum sheathing board, 6.4 mm (1/4") thick minimum to ASTM C1177/C1177M-08, primed finish where used as substrate for adhesive applied materials.
      - .1 Acceptable *Products*:
        - .1 Georgia Pacific 'DensDeck Prime'.
  - .3 Insulation:
    - .1 INS-51:
      - .1 Rigid polyisocyanurate insulation board, inorganic felt faced:
        - .1 Description: Closed-cell polyisocyanurate foam core integrally laminated to heavy, durable and dimensionally stable inorganic coated-glass facers, CAN/ULC S704-03 Type 2 and Class 2, HCFC free, 138 kPa (20 psi) minimum compressive strength (at 10% deformation), CAN/ULC-S126-06, CAN/ULC S107-03. LTTR value to CAN/ULC S770-09.
      - .2 Where indicated as tapered:
        - .1 Factory tapered 1:48 (1/4 inch per 12 inches) minimum and as indicated on drawings, and flat board configurations.

Polyvinyl-Chloride (PVC) Roofing

---

- .2 Provide preformed saddles, crickets, tapered edge strips, sumps, 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.
- .4 Air/vapour barrier membrane:
  - .1 Thickness: 0.8 mm (32 mils).
  - .2 Description:
    - .1 Self-adhesive vapour barrier that can also serve as temporary roof protection.
    - .1 Basis of design:
      - .1 Sarnafil 'SarnaVAP-SA', self-adhered.
  - .3 Primer: as recommended by manufacturer to suit substrate.
- .5 Sheathing board:
  - .1 Factory primed glass mat faced exterior grade gypsum sheathing board, 12.7 mm (1/2") thick minimum to ASTM C1177/C1177M-08.
  - .1 Basis of design:
    - .1 DensDeck Prime' by Georgia Pacific
- .6 Flashings:
  - .1 Flashings not exposed in final assembly or for attachment of membrane: Refer to Section 07 62 00.
  - .2 Membrane coated flashings coloured PVC sheeting as above, heat welded to 0.61 mm (0.0239") (24 gauge) minimum thickness Z275 galvanized steel.
- .7 Sealant: Two part polyurethane conforming to CAN/CGSB 19.24-M90, and containing no bituminous substances.
- .8 Fastening accessories:
  - .1 Membrane adhesives: Low VOC (250 gm/L maximum), product as recommended by roofing membrane manufacturer.
  - .2 Cover board adhesive: as approved by cover board and roofing membrane manufacturer.
  - .3 Insulation adhesive: as approved by insulation and roofing membrane manufacturer.
  - .4 Insulation fasteners and plates: to FM 4470-12. Fastener length to penetrate top flute of metal decking by a minimum of 19 mm (3/4") and maximum of 25.4 mm (1").
  - .5 Sheathing board fasteners:
    - .1 Flat head, self-tapping, corrosion resistant coating, to FM 4470-12.
    - .2 Fastener plates where required to meet the requirements of Factory Mutual 4470 for wind uplift. Fastener length to penetrate top flute of metal decking by a minimum of 19 mm (3/4") and maximum of 25.4 mm (1").
- .9 Metal termination bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3.2 mm (1/8") thick; with anchors.

Polyvinyl-Chloride (PVC) Roofing

---

- .10 Miscellaneous accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants and termination reglets.
- .11 Wood blocking and plywood: in accordance with Section 06 10 53.
- .12 Snow protection: PVC type compatible with membrane, as recommended by membrane manufacturer; located where indicated.
- .13 Snow guards:
  - .1 Extruded aluminum brackets with stainless steel base plate, with 25.4 mm (1") diameter pipe.
  - .2 Basis of design:
    - .1 Alpine SnowGuards '115 Pipe-style', 3 pipes.
  - .3 Colour: to match roofing membrane.
  - .4 Fasteners: compatible with snow guards and roofing membrane.
- .14 Decorative battens/décor profile: extruded PVC battens in colour to match roofing membrane.
  - .1 Locations as indicated.

## **2.4 Fabrication**

- .1 Whenever practicable, factory fabricate and heat weld seams in sheets of sizes designated on reviewed shop drawings. Supply membrane sheets as large as possible to minimize field joints.
- .2 Prefabricate where necessary, junctions and flashing upstands around penetrations and openings in membranes.
- .3 Fabricate premoulded inside and outside corners with or without preformed cant sections for corners or field fabricated corners to manufacturer's instructions.

## **PART 3 - EXECUTION**

### **3.1 Examination**

- .1 Before proceeding with application, ensure that:
  - .1 Roof deck is constructed smoothly; in true planes; and level, or sloped to drains, whichever is design intent.
  - .2 Roof deck is clean and sufficiently dry for application under specified warranty.
  - .3 Adjacent construction and installation of work is completed.
  - .4 Adjacent construction and installation of work of other sections incorporated with roof is completed.
  - .5 Roofing surfaces are free of cracks that are wider than bridging ability of roofing materials.
  - .6 Preparations have been made for bases on which equipment will be installed.
  - .7 Work that penetrates roof has been installed.

Polyvinyl-Chloride (PVC) Roofing

---

- .8 Deck has been reviewed and accepted by *Consultant* and membrane manufacturer prior to start of roofing work.

### 3.2 General Installation Requirements

- .1 Do roofing work in accordance with applicable recommendations in CRCA Roofing Specifications Manual, ASTM D4434/D4434M-15, and in accordance with manufacturer's printed specifications and installation instructions, with greater requirements governing.

### 3.3 Preparation

- .1 Immediately following acceptance of slopes, support and surface conditions of support decking, commence application.
- .2 Examine materials over which work of this section is applied and ensure that roof decks are free of snow, ice, loose or adhering materials which would impair this work. Substrate shall be clean, dry and suitable for roofing application.
- .3 Undertake spot levels in an approved manner to determine if there is any unevenness in roof decks which may result in ponding of water on completed roofing in excess of 12.7 mm (1/2") depth.
- .4 Advise *Consultant* of areas requiring corrections and forward tabulation of results of spot levels.
- .5 Roof surfaces shall be free of ponding water, ice, and snow.
- .6 Do not proceed with roofing work until areas where water will pool or other surface defects are corrected to the acceptance of *Consultant*.

### 3.4 Installation

- .1 Follow manufacturer's instructions using only compatible adhesives and compounds recommended by manufacturer in quantities and techniques so recommended. Install membrane sheets to layout and details shown on reviewed shop drawings.
- .2 Welding method shall be hot air method only. Do hand welding, machine welding and progressive testing of seams in strict accordance with manufacturer's instructions.
- .3 Carry membrane up perimeter walls to height shown. Lap and weld joints minimum 50 mm (2") for hand welding and minimum 100 mm (4") for machine welding. Machine weld wherever practicable.
- .4 Extend membrane onto flashing flanges of deck drains and weld; make watertight. Lap end joints and seal.
- .5 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.
- .6 At flashing termination points and roof drains, incorporate manufacturer's recommended materials, adhesives, sealing strips, and stainless steel compression rings and accessories to ensure completely waterproof system sealed against windblown water or air infiltration. Ensure continuity and integrity of air seal membrane and sheet membrane roofing assembly.
- .7 Flash at roof perimeter and penetrations through roof as detailed and conforming to manufacturer's standard details. Coordinate work of this section with metal counter flashings specified in Section 07 62 00.

- .8 Provide continuity between vapour barriers of this section and of Section 07 27 00 by lapping membrane with same. Coordinate with Section 07 27 00.

### **3.5 Parapet and Projection Blocking**

- .1 Install plywood as detailed and required, at entire perimeter of roof and at projections. Support ends of plywood and fasten to substrate at a rate of 1 fastener per 0.2 m<sup>2</sup> (2ft<sup>2</sup>).
- .2 Install blocking at entire perimeter of roof and at projections and penetrations as detailed and required. Match height of blocking with height of insulation. Anchor blockings to deck 305 mm (12") on centre to resist a force of 2.5 kN/m (175 lb/ft) in any direction.

### **3.6 Sheathing Board**

- .1 Lay sheathing 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 ½ the board width.
- .2 Ensure sheathing is immediately protected with membrane.
- .3 Mechanically fasten sheathing to steel deck with self-tapping, galvanized screws, spaced evenly to each board and to only top flanges of steel deck. 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 the deck.

### **3.7 Installation of Self-Adhesive Air / Vapour Barrier**

- .1 Beginning at the bottom of the slope, without adhering the membrane, unroll onto the substrate for alignment. Do not immediately remove the silicone release sheet.
- .2 Align the roll parallel to the corrugations of the steel deck. Make sure the membrane overlaps are supported along their entire length.
- .3 Peel back one end of the silicone release sheet and adhere this part of the membrane to the substrate. Peel back the remaining release sheet at a 45° angle to avoid wrinkles in the membrane.
- .4 If the membrane is not properly aligned, do not try to adjust it. Instead, cut the roll and start again, making sure that it is properly aligned and that it overlaps the end of the misaligned piece by 150 mm (6").
- .5 Overlap adjacent membranes by 100 mm (4"). Overlap end laps by 150 mm (6"). Stagger end laps by at least 305 mm (12"). Seal joints and edges with butyl tape to ensure continuity of vapour envelope.

### **3.8 Insulation Application**

- .1 Install rigid insulation boards with long side at right angle to deck flutes. Provide full support at ends. Cut and trim insulation boards to provide plain butt joints at perimeter, parapet and curbs. Lay insulation boards in parallel course, butted together in moderate contact without gaps, with staggered end joints. Lay rigid insulation in 2 layers with joints staggered. Place sloped insulation saddles at obstructions to roof drainage and as indicated; stagger joints over rigid insulation. Slope to drains, 2% minimum.
- .2 Adhesively applied insulation:

Polyvinyl-Chloride (PVC) Roofing

---

- .1 Apply insulation to substrate or to adjoining board with specified adhesive applied in 50 mm (2") wide bands every 305 mm (12") or in 100 mm (4") diameter spots (9 spots per square metre) at a rate of 2 to 3 kg per square metre.
- .3 Mechanically fastened insulation:
  - .1 Fasteners must be attached to steel deck's upper flutes and at spacing to meet performance requirements, in accordance with roofing manufacturer's installation instructions
- .4 Offset board joints with successive board layers, minimum 300 mm (12"). Place tapered insulation where as indicated, in accordance with reviewed shop drawings.
- .5 Install only as much insulation as can be covered with membrane roofing in the same day.
- .6 Install insulation boards with edges in moderate contact without forcing and fill gaps greater than 6 mm (1/4") with insulation.
- .7 Cut insulation to fit to blocking, upstands, and penetrations through roof; fill gaps greater than 6 mm (1/4") with insulation.
- .8 *Provide* cut-offs by installing strip of air / vapour barrier membrane to seal sections of roofing to smaller sections, and at the exposed edges of insulation under at roof edges and vertical surfaces. Install water cut-offs between base sheet and air / vapour barrier to provide watertight separation to adjacent roofing section.
  - .1 Locate water cut-offs at 929 m<sup>2</sup> (10,000 sf) maximum sections.

### 3.9 Cover Board

- .1 Firmly set the boards, long joints continuous and short joints staggered. Boards shall be evenly and tightly butted together.
- .2 Vertical joints between boards and insulation shall be staggered, minimum 150 mm (6").
- .3 Apply only as many boards as can be covered with base sheet in the same day.
- .4 At parapets and curbs mechanically fasten cover board to substrate before installation of self-adhesive base flashings. Use 6.4 mm (1/4") overlay boards at these locations.
- .5 Adhesively applied cover board:
  - .1 Apply insulation adhesive to underside and immediately bond cover board to substrate.

### 3.10 Fully Adhered System

- .1 Install roofing membrane in accordance with roof membrane manufacturer's written requirements.
- .2 Install premoulded membrane without folds or wrinkles. Follow roof manufacturer's layout drawings. Overlap membrane to overlap line provided on membrane.
- .3 Fully adhere roofing membrane, with no air pockets in accordance with roof manufacturer's installation instructions.
- .4 Hot air weld overlaps according to membrane manufacturer's recommendations.
  - .1 Spacing of seams to match spacing of décor profiles indicated.

Polyvinyl-Chloride (PVC) Roofing

---

**3.11 Flashing Membrane**

- .1 Adhere flashing membrane with membrane adhesive to vertical areas and flashing. Using a lambs wool roller, coat substrate with adhesive at rate recommended by manufacturer and dry 1 hour, as required.
- .2 Unroll flashing membrane in position. Coat underside of membrane with membrane adhesive at recommended rate and allow to dry tack. Press membrane to substrate and roll solidly in, removing air bubbles.
- .3 Do not apply adhesive to lap area. Clean with recommended cleaner if necessary.
- .4 Install a continuous strip of butyl tape between membrane flashings and cap flashings.

**3.12 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 supplemented as follows:
  - .1 Membrane manufacturers field representative shall be on-site and review installation a minimum of once per week during roofing installation.

**3.13 Adjusting and Cleaning**

- .1 Upon completion of work of this section, clean up surplus materials and debris attributable to this section.

**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.

### **1.2 Administrative Requirements**

- .1 Coordination:
  - .1 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.
  - .2 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 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.
  - .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:

Joint Firestopping and Smoke Seals

---

- .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:
  - .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*.
  - .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.

Joint Firestopping and Smoke Seals

---

## 1.4 Quality Assurance

### .1 Qualifications:

- .1 *Provide* work of this section, executed by installers with experience 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.
  - .2 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 instructions 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.
  - .2 A/D Fire Protection Systems Inc.
  - .3 Dow Corning.
  - .4 Hilti Canada Corp.
  - .5 Nuco – Self-Seal Firestopping Products.
  - .6 Specified Technologies Inc.
  - .7 Tremco Canada Ltd.

Joint Firestopping and Smoke Seals

---

## 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 to allow for vertical movement, allowing wall to move independent of structure, due to forces such as live loads, dead loads, thermal expansion/contraction, wind sway, without damaging the wall assembly or its fire protection components.
    - .1 Provide head-of-wall joints with dynamic designation.
- .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.
  - .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.

### Joint Firestopping and Smoke Seals

---

- .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 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.

### 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 Documentation for installed joint firestop systems is to include:

Joint Firestopping and Smoke Seals

---

- .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.
- .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 Quality control to be in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00 and as follows:
  - .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, inspection and testing company, manufacturer, and *Consultant* present.
  - .4 Inspection and testing company shall examine installed firestopping in accordance with ASTM E2393-10a. 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.

**END OF SECTION**

Joint Sealants

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Exterior building sealants.
  - .2 Interior building 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.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators: Execute the work of this section only by a *Subcontractor* with experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers. Installer to comply with quality assurance articles referenced in ASTM C1193-16 for installation of joint sealants.
- .2 Mock-up:
  - .1 Provide 2440 mm (96") long sealant joint mock-up for each condition listed in the interior and exterior sealant schedule as specified herein.
  - .2 Accepted mock-up may remain as part of completed work.

## Joint Sealants

---

### 1.5 Field Conditions

- .1 Verify substrates and ambient air temperature at the *Place of the Work* before, during and after application to ensure compliance with manufacturer's recommendations. Surfaces shall be frost-free, dust-free, clean and completely dry at time of installation.
- .2 Weather Conditions: In accordance with manufacturer's instructions, do not apply silicone joint sealants in snow, rain, fog or mist, or when such conditions are expected. Allow joint surfaces to attain dry conditions as recommended by manufacturer before sealant application.
- .3 Sealant and substrate materials: Conform to sealant manufacturer's specifications and recommendations. Keep organic sealant materials heated to at least 16°C when working at temperatures below 10°C.

## PART 2 - PRODUCTS

### 2.1 Sealants

- .1 General:
  - .1 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.
  - .2 Comply with ASTM C920-11 and other requirements indicated for each liquid-applied chemically curing sealant, including those referencing ASTM C920-11 classifications for type, grade, class, and uses.
  - .3 For sealants to be applied to porous substrates: Provide products that have undergone testing according to ASTM D1248-12 and have not stained porous joint substrates indicated for *Work*.
  - .4 Sealant supplied shall not exude any material(s) which travels into adjacent materials, or travels onto surfaces of adjacent materials; causing damage, or attracting soiling, which becomes apparent during the service life of the building.
- .2 Exterior sealants:
  - .1 Sealant: single-component, non-sag, low to medium modulus non-bleed, high-performance silicone joint sealant, in accordance with the following:
    - .1 Comply with:
      - .1 ASTM C920-11, Type S, Grade NS, Class 50 or greater.
      - .2 CAN/CGSB 19.13-M87.
      - .3 SWR Institute Sealant Validation Program.
    - .2 Acceptable *Products*:
      - .1 Dow Corning '790'.
      - .2 Dow Corning '795'.
      - .3 Momentive 'Silpruf NB SCS2700 or SCS 2000'.
      - .4 Sika 'Sikasil WS-290'.

## Joint Sealants

---

- .5 Sika 'Sikasil WS-295'.
- .6 Tremco, Inc. 'Spectrem 1'.
- .3 Interior general sealants:
  - .1 VOC limit: less than 250 g/L.
  - .2 Interior sealant; at joints with painted gypsum board: one-component paintable acrylic or polyurethane sealant in accordance with the following:
    - .1 Comply with:
      - .1 ASTM C834-10.
      - .2 CGSB 19-GP-5M-1984.
    - .2 Acceptable *Products*:
      - .1 Sika 'Sikaflex 1A'.
      - .2 Tremco, Inc. 'Tremflex 834'.
  - .3 Interior sealant, mildew resistant one part silicone sealant in accordance with the following:
    - .1 Comply with:
      - .1 ASTM C920-11, Type S, Grade NT, Class 25
      - .2 CAN/CGSB 19.22-M89.
    - .2 Acceptable *Products*:
      - .1 BASF Building Systems "OmniPlus";
      - .2 Dow Corning "786"
      - .3 Momentive "Sanitary SCS1700 Sealant"
      - .4 Sika 'Sikasil GP'.
      - .5 Tremco, Inc. "Tremsil 200";

## 2.2 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.
- .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.

## Joint Sealants

---

- .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.

## 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 Non-porous surfaces shall be cleaned using the two-cloth wipe method as referenced in ASTM C1193-16 and outlined by joint sealant manufacturer's instruction.
- .6 Rusting or scaling surfaces shall be prepared using abrasive cleaning methods as recommended by joint sealant manufacturer prior to joint sealant installation. Efflorescence, mould, mildew and algae must be removed and neutralized prior to joint sealant installation.
- .7 Coordinate cleaning, priming and installation to avoid contamination of wet, freshly coated or adjacent finished surfaces. Prepare finish-coated surfaces per joint sealant manufacturer's specific recommendations.

## Joint Sealants

---

- .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 Review the complete *Contract Documents* for extent of sealant work required.
- .2 Apply joint sealants for continuous waterproof sealant joint protection. Vertical joints shall be lapped 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.
- .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.
- .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 Install, providing uniform cross-sectional shapes and depths in relation to joint width for optimum sealant movement capability per joint sealant manufacturer's instructions.
- .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 as outlined in Field Quality Control paragraphs in this section.
- .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*.

### Joint Sealants

---

- .8 When surfaces of adjacent materials are to be painted, perform sealant work before these surfaces are painted.
- .9 Verify contact materials are compatible with primer and sealant. When incompatible, inform *Consultant* and change primer and sealant to compatible type acceptable to *Consultant*.
- .10 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.
- .11 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.
- .12 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.
- .13 On horizontal traffic surfaces, support joint filler against vertical movement which might result from traffic loads, including foot traffic.
- .14 Pack joints tightly with sealant backing set at depth specified for sealant. Fill other voids with filler.
- .15 Install bond breaker tape in bottom of joints in lieu of sealant backing where proper depth cannot be obtained when backing is installed.
- .16 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.
- .17 Fillet bead sealant joints to be sized to provide proper contact area with substrates, in accordance with manufacturer's written recommendations.
- .18 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.
- .19 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.
- .20 Remove droppings and excess sealant as work progresses, before material achieves initial set.
- .21 Primer is mandatory for gun applied sealants.
- .22 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.
- .23 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.

## Joint Sealants

---

- .2 Exterior sealant work is part of the work of this section. Install sealant to locations indicated, scheduled, or required including, but not limited 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.

### 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 locations indicated, scheduled, or required including, but not limited to:
  - .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 Counter/wall junctions at countertops.

### 3.7 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00.
  - .1 Field-adhesion testing: Installer to keep daily log of sealant installation recording self-performed field-adhesion test at each elevation of the project and as follows:
    - .1 Record field adhesion testing on digital video camera and submit to *Consultant*.
    - .2 Document and perform field adhesion testing in accordance with manufacturer's recommended field-adhesion requirements and submit written reports co-signed by sealant manufacturer's representative. Coordinate with Section 01 45 00.

### Joint Sealants

---

- .3 Perform 5 field adhesion tests for the first 300 m (1000 lineal feet) and one test in each 300 m (1000 lineal feet) of sealant joint length thereafter. One (1) test per floor height and per elevation is also recommended. When the sealant is used to weatherseal between 2 dissimilar substrates, the sealant adhesion to each side of the joint should be individually tested.
  - .4 Field test joint sealants in accordance with Method A, Field-Applied Sealant Joint Hand-Pull Tab, in Appendix X-1 in ASTM C1193-16 and in compliance with manufacturer's specific recommendations.
  - .5 Evaluation: In compliance with joint sealant manufacturer, joint sealants tested and not indicating adhesive failure within the substrates are considered satisfactory results. For joint sealants that fail to adhere to the substrate, clean, re-install and then re-test until satisfactory results are obtained.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.
- .1 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 Clean off excess sealant or sealant residue adjacent to sealant joint installations as the work progresses by methods approved by joint sealant manufacturer.
- .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.
- .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**

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 Thermally broken metal door frames (thermally broken steel frames).

### **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.

### **1.3 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Submit copy of NAAMM-HMMA 840-07 standard.
- .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 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.
- .5 Samples:
  - .1 Submit cut-away sample door, with provision for lockset and hinge, and corner section of frame.

### **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

---

### .2 Mock-up:

- .1 *Provide* mock-up of door and frame assembly, location as indicated by *Consultant*.
- .2 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 Manufacturer

- .1 The following manufacturers are approved for work of metal doors and frames:
  - .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 Gensteel Doors.
  - .7 LMT Group Inc.
  - .8 M.J. Daley Manufacturing Co. Ltd.
  - .9 Shanahan's Manufacturing Ltd.
  - .10 Trillium Steel Doors Limited.
  - .11 Vision Hollow Metal Limited.

### 2.2 Performance/Design Requirements

- .1 Exterior insulated metal doors shall be tested to meet an operable U-value of 0.400.
- .2 Fire rating requirements:
  - .1 Fire rated labelled doors and frames: tested to CAN/ULC-S104-10 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 80-2010, except where indicated otherwise.

Steel Doors and Frames

---

## 2.3 Materials

- .1 Steel:
  - .1 Fabricated from tensioned levelled steel to ASTM A924/A924M-16ae1, galvanized to ASTM A653/A653M-11, 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: Galvanneal coating designation ZF120 (A40).
- .2 Door core materials:
  - .1 Honeycomb: Structural small cell 25 mm (1") maximum kraft paper 'honeycomb'. Weight: 36.3 kg (80 lb) per ream (minimum). Density: 16.5 kg/m<sup>3</sup> (1.03 pcf) minimum, sanded to required thickness.
  - .2 Polyisocyanurate: Closed cell, faced board, thermal value: RSI 2.17 (R12.3) minimum, conforming to ASTM C1289-16.
- .3 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.
- .4 Primer: rust inhibitive for touch-up.
- .5 Finishing hardware: in accordance with Section 08 71 00.
- .6 Miscellaneous:
  - .1 Door silencers: single stud rubber or neoprene type.
  - .2 Exterior top caps: Rigid polyvinylchloride extrusion.
  - .3 Frame thermal breaks: Rigid polyvinylchloride extrusion.
  - .4 Glazing stops: formed channel of minimum 0.81 mm (0.032") (20 gauge) steel, 15.9 mm (5/8") high.

## 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:

### Steel Doors and Frames

---

- .1 *Provide* clearance at floor with allowance made for indicated finish flooring materials.
- .2 Clearances for Fire-Rated Doors: As required by NFPA 80-2010.
- .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 80-2010, 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 to CSA W59-13.
- .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 Exterior and insulated doors and panels:
  - .1 Face sheets fabricated from 1.34 mm (0.053") (16 gauge) steel.
  - .2 Insulation core:
    - .1 Polyisocyanurate.
  - .3 Longitudinal edges mechanically interlocked.
    - .1 Adhesive assisted with edge seams visible.
- .3 Heavy duty doors and panels; honeycomb core:
  - .1 Face sheets fabricated from:
    - .1 1.34 mm (0.053") (16 gauge) steel.
  - .2 Longitudinal edges continuously welded the full height of the door, filled and ground smooth with no visible seams.
- .4 Interior and non-insulated doors and panels:

### Steel Doors and Frames

---

- .1 Face sheets fabricated from 1.06 mm (0.042") (18 gauge) steel.
- .2 Honeycomb core.
- .3 Longitudinal edges mechanically interlocked.
  - .1 Adhesive assisted with edge seams visible.
- .5 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.
- .6 Formed edges shall be true and straight with minimum radius for the thickness of steel used.
- .7 Lock and hinge edges shall be bevelled 3 mm in 50 mm (1/8" in 2") unless hardware or door swing dictates otherwise.
- .8 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.
- .9 Prior to shipment, mark each door with an identification number as shown on the approved submittal drawings.
- .10 Exterior doors shall be provided with factory installed flush PVC top caps. Fire labelled exterior doors shall be provided with factory installed flush steel top caps.
- .11 Blank, reinforce, drill and tap doors for mortised, templated hardware. Locate hardware to manufacturer's standard unless indicated otherwise.
- .12 Holes 12.7 mm (1/2") and larger shall be factory prepared.
- .13 Glazing:
  - .1 For glazing materials up to and including 8 mm (5/16") thick, doors shall be provided with 0.81 mm (0.032") (20 gauge) steel glazing trim and snap-in glazing stops.
  - .2 For glazing materials greater than 8 mm (5/16") thick, doors shall 0.81 mm (0.032") (20 gauge) steel trim and screw fixed glazing stops. Screws shall be #6 x 32 mm (1 1/4") oval head Tek™ (self-drilling) type at 305 mm (12") on centre maximum.
  - .3 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.
- .14 Fabricate closing stiles of paired doors as indicated or scheduled.
- .15 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.
- .16 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 grill opening.

## 2.6 Fabrication – Steel Frames

- .1 General: Applicable to frames, transom panel frames, sidelights, and window assemblies.
  - .1 Fabricated from:
    - .1 1.34 mm (0.053") (16 gauge) steel.

Steel Doors and Frames

---

- .2 1.70 mm (0.067") (14 gauge) steel for frames noted as heavy duty.
- .2 Supplied set-up and welded (SUW).
- .3 Interior and exterior sections of thermally broken frames, separated by continuous PVC thermal break.
- .4 Thermally broken sections shall not be assembled by means of screws, grommets or other fasteners.
- .5 Welds shall not cause thermal transfers between interior and exterior surfaces of the frame sections.
- .6 Closed sections (mullions and center rails) factory insulated with 24 kg/m<sup>3</sup> (1.5 pcf) loose batt type fibreglass material.
- .7 Incorporate head drips of same gauge material as frame and plug weld at 150 mm (6") on centre, fill and sand smooth.
- .2 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).
- .3 Factory assembled frame product shall be square, free of defects, warps or buckles.
- .4 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".
- .5 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.
- .6 Glazing stops shall be formed 0.81 mm (0.032") (20 gauge) steel, 16 mm (0.625") height channel, accurately fitted, butted at corners and fastened to frame sections with #6 x 32 mm (1¼") oval head Tek (self-drilling) type screws at 305 mm (12") on centre maximum.
- .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.
  - .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.

### Steel Doors and Frames

---

- .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 Fasten removable stops by counter-sunk Phillips head screws at approximately 225 mm (9") on centre symmetrically spaced on stop length.
- .14 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.
- .15 Grind welded corners to a flat plane, fill with metallic paste filler and sand to uniform smooth finish.
- .16 Protect strike and hinge reinforcements using guard boxes welded to frames at masonry construction.
- .17 Reinforce head of frames wider than 1220 mm (48").
- .18 Brace frame units to prevent distortion in shipment and protect finish.

## 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.

Steel Doors and Frames

---

- .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.
  - .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.

## Steel Doors and Frames

---

- .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.
- .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.

## Steel Doors and Frames

---

- .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  $\pm 1.6$  mm ( $\pm 0.063$ ").
- .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  $\pm 1.2$  mm ( $\pm 0.047$ ").
- .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  $\pm 1.2$  mm ( $\pm 0.047$ ").
- .4 Manufacturing tolerances on formed frame profiles shall be  $\pm 0.8$  mm ( $\pm 0.031$ ") for faces, door stop heights and jamb depths. Tolerances for throat openings and door rabbets shall be  $\pm 1.6$  mm ( $\pm 0.063$ ") and  $\pm 0.4$  mm ( $\pm 0.016$ ") respectively. Hardware cut-out dimensions shall be as per template dimensions,  $\pm 0.4$  mm ( $\pm 0.015$ ").

### 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.

## PART 3 - EXECUTION

### 3.1 Examination

- .1 *Provide* necessary grounds, bracing and strapping for fitting and adequate for securing of the work.

## Steel Doors and Frames

---

- .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 840-07.
- .2 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  $\pm 1.6$  mm ( $\pm 1/16$ ").
  - .2 Squareness tolerance, measured through a line  $90^\circ$  from one jamb at the upper corner of the product, to the opposite jamb, shall be  $\pm 1.6$  mm ( $\pm 1/16$ ").
  - .3 Alignment tolerance, measured on jambs, through a horizontal line parallel to the plane of the wall, shall be  $\pm 1.6$  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  $\pm 1.6$  mm ( $\pm 1/16$ ").
- .3 Fire labelled product shall be installed in accordance with NFPA 80-2010.
- .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 Execute installation and assembly using skilled forces under supervision of a competent joinery foreperson.
- .8 Install doors in accordance with NAAMM-HMMA 840-07, maintaining clearances outlined in paragraph 2.9 of this section.
- .9 Install finishing hardware in accordance with ANSI A115.1G-1994, manufacturers' templates and instructions, and Section 08 71 00.
- .10 Adjust operable parts for correct clearances and function.
- .11 Steel surfaces shall be kept free of grout, tar or other bonding materials or sealers.
- .12 Remove grout or other bonding material from products immediately following installation.
- .13 *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.
- .14 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.

### Steel Doors and Frames

---

- .15 Fill and grind smooth "punch and dimpled" frame installations.
- .16 Prior to site touch-up, exposed surfaces of galvanized 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.
- .17 Touch-up exposed field welds shall be finished to present a smooth uniform surface and with a rust inhibitive primer.
- .18 Touch-up exposed surfaces that have been scratched or otherwise marred during shipment, installation, and handling shall be with a rust inhibitive primer.
- .19 Finish paint in accordance with Section 09 91 00.
- .20 Install door silencers.
- .21 Adequately fasten units and secure in place with concealed fixings wherever possible. Include grounds and furring where required.
- .22 Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.
- .23 Make allowance for deflection to ensure structural loads are not transmitted to frames.
- .24 Adjust operable parts for correct clearances and function.

### **3.3 Installation - Finishing Hardware**

- .1 Install finishing hardware in accordance with 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* instructions.
- .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* instructions.

**END OF SECTION**

Flush Wood Doors

---

## **PART 1- GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Solid core doors with wood veneer.
  - .2 Factory finishing wood doors.
- .2 Coordination:
  - .1 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.

### **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 door location using numbering system per door schedule, size, and hand of each door, elevation of each door type; undercuts, bevelling, construction type core and edge construction not covered in product data; and special blocking requirements.
  - .2 Indicate dimensions and locations of factory machining criteria for hardware, extent of hardware blocking.
  - .3 Indicate dimensions and locations of cut-outs including trim for openings.
  - .4 Indicate doors to be factory finished and finish requirements.
  - .5 Indicate electrified hardware requirements and preparations.
- .4 Verification samples:
  - .1 Submit cut-away sample of each type of door, to show stile and rail construction, core, cross banding, door face finish and edges.
  - .2 Submit solid lumber frames for light openings, minimum 150 mm (6") long, for each material, type and finish required.

### **1.3 Quality Assurance**

- .1 Qualifications:
  - .1 Manufacturer shall be a member in good standing of the Architectural Woodwork Institute or the Architectural Woodwork Manufacturers Association of Canada or the Woodwork Institute.
- .2 Quality standard:

Flush Wood Doors

---

- .1 Work shall be in accordance with the Architectural Woodwork Standards Edition 2-2014, Premium Grade.

#### **1.4 Delivery, Storage, and Handling**

- .1 Door numbers shall be marked with door numbers used on shop drawings in the top hinge cavity created by the machining for hinges.
- .2 Identify doors with labels. Package with resilient packaging.
- .3 Store doors flat at the *Place of the Work* in piles with bottom face on bottom of pile. Protect from moisture by placing water resistant material under skids supporting piles. Cover top of piles and provide air at sides of piles.
- .4 Deliver the wood doors only after the building is closed and dry and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period. Do not receive the doors in a damp area. Do not drag the doors on the ground, floor or across one another.

#### **1.5 Field Conditions**

- .1 Environmental conditions:
  - .1 During storage and installation: Obtain and comply with wood door manufacturer's instructions for optimum temperature and relative humidity conditions for wood doors during its storage and installation. Do not install wood doors until these conditions have been attained.
  - .2 During finishing: Comply with wood door manufacturer's temperature and humidity requirements before, during, and after application of finishes.
  - .3 During service life of woodwork: Obtain and comply with wood door manufacturer's advice for optimum temperature and humidity conditions.

### **PART 2- PRODUCTS**

#### **2.1 Manufacturer**

- .1 Algoma Hardwoods, Inc.
- .2 Baillargeon Doors, Inc.
- .3 Lambton Doors.
- .4 Marshfield Door Systems.
- .5 Mohawk Flush Doors, Inc.
- .6 Substitutions: in accordance with Section 01 25 00.

#### **2.2 General**

- .1 Single-source manufacturing and fabrication responsibility: Engage a qualified Manufacturer to assume undivided responsibility for wood doors specified in this section, including fabrication and finishing except where site finishing is specified.

#### **2.3 Door Construction**

- .1 Performance duty level:

Flush Wood Doors

---

- .1 Doors shall meet the requirements of ANSI/WDMA I.S. 1A-13 for Heavy Duty Performance Level unless otherwise indicated or scheduled.
- .2 Solid particleboard core, veneer faced, non fire rated and 20 minute fire rated wood door construction to Architectural Woodwork Standards Manual, Section 9 and as follows:
  - .1 Type PC-5, particle board core to ANSI A208.1-2009 LD-2 (minimum 529 kg/m<sup>3</sup> (33 lbs/ft<sup>3</sup>) density).
- .3 Bonding:
  - .1 Bond stiles and rails to core; abrasive sand core assembly to achieve uniform thickness prior to lamination of door faces.
- .4 Panel edge types:
  - .1 Wood veneer faced doors for transparent finish:
    - .1 For vertical edges (stiles) and exposed horizontal edges (rails). (Exposed horizontal edges are those edges that can be viewed from floors above.):
      - .1 Edge Type A: Minimum 11 mm (7/16") thick solid hardwood, species to match face veneer, and referenced quality standard.
      - .2 Inset solid wood edging shall have consistent moisture content as panel core material, be glued securely, and calibrated with panel core thickness prior to being laminated with wood veneer on both sides.
      - .3 Non rated or 20 minute fire rated doors: Solid hardwood edge to be laminated to minimum 25.4 mm (1") structural composite lumber backer.
    - .2 For unexposed horizontal edges (rails):
      - .1 Non rated or 20 minute fire rated doors: Minimum 25 mm (1") structural composite lumber.
- .5 Blocking:
  - .1 *Provide* hardware blocking for doors as follows:
    - .1 Non-rated or 20 minute fire rated doors: Structural composite lumber for hardware blocking.
    - .2 HB-1, minimum 125 mm (5") wide, full door width, top-rail blocking for closure devices or flush bolts or for sliding door hardware.
    - .3 HB-2, minimum 125 mm (5") wide, full door width, bottom-rail blocking for doors with protection plates, concealed door seals, automatic bottoms, pivots or floor bolts.
    - .4 HB-4, minimum 125 mm (5") wide x 250 mm (10") high blocking for doors with mortise locks and pockets.
    - .5 HB-5, minimum 125 mm (5") wide x 250 mm (10") high blocking for hinges.
    - .6 HB-6, minimum 125 mm (5") wide, full door width, mid-rail blocking for exit devices.
    - .7 HB-7, minimum 125 mm (5") wide, full door height, for doors with continuous type hinges.

- .6 Thickness:

Flush Wood Doors

---

- .1 45 mm (1-3/4") minimum unless otherwise indicated or scheduled.

## **2.4 Veneer Faced Doors For Transparent Finish**

- .1 Veneer species: White Oak.
- .2 Veneer cut: Rift.
- .3 Veneer leaf matching: Book.

## **2.5 Accessories**

- .1 Finishing hardware: in accordance with Section 08 71 00.

## **2.6 Fabrication**

- .1 Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - .1 Clearances: Refer to Part 3 for clearance tolerances.
  - .2 Fit doors for automatic door bottoms.
  - .3 Bevel non-fire-rated doors 3-1/2 degrees (1/8 inch in 2 inches) at lock and hinge edges.
- .2 Fabricate doors with hardware blocking as specified in Part 2 of this Section.
- .3 Factory machine doors for finish hardware that is not surface applied. Do not machine for surface hardware. Locate hardware to comply with Door and Hardware Institute (DHI) "Recommended Locations for Architectural Hardware for Flush Wood Doors (latest edition). Comply with final reviewed hardware schedules, door and frame shop drawings and hardware templates.
  - .1 Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- .4 Electrified hardware: 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, 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.
- .5 Factory cut and trim openings.
- .6 Transom and side panels:
  - .1 Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

## **2.7 Factory Finishing**

- .1 Finish work in factory in accordance with Architectural Woodwork Standards Manual, Section 9 and referenced quality standard.

Flush Wood Doors

---

- .2 Prior to finishing, 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.
- .1 Comply with requirements indicated below for finish system, staining, and sheen.
  - .1 White wash finish; 2-part cerused stain finish, 10° sheen conversion vinyl varnish seal and topcoat; AWMAC system #5 with custom filled finish.
- .2 Seal top and bottom door edges.

### **PART 3 - EXECUTION**

#### **3.1 Examination**

- .1 *Provide* necessary grounds, bracing and strapping for fitting and adequate for securing of the work.

#### **3.2 Installation - General**

- .1 Execute installation and assembly at the *Place of the Work* using skilled forces under supervision of a competent joinery foreperson.
- .2 Install work plumb, level and straight, and fasten it securely to backing to support itself and anticipated superimposed loads.
- .3 Build into construction as indicated, or specified in other sections of this specification, or both.
- .4 Adequately fasten units and secure in place with concealed fixings wherever possible. Include grounds and furring where required.

#### **3.3 Installation - Doors**

- .1 Coordinate installation of doors with installation of frames specified in other Sections and hardware specified in Section 08 71 00.
- .2 Align and fit doors in frames with uniform clearances as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - .1 Clearances:
    - .1 Provide clearances as follows except where more stringent clearance is required or indicated.
    - .2 Provide 3.18 mm (1/8") maximum clearance between door and frame at heads, jambs, and between pairs of doors.
    - .3 Provide minimum 6 mm (1/4") clearance from bottom of door and top of floor finish.
    - .4 At door assemblies having fire-protection rating not less than 20-minutes provide clearance not more than 6 mm (1/4") at the bottom and not more than 3 mm (1/8") at the sides and top.

Flush Wood Doors

---

- .3 Seal top and bottom edges of wood doors if they are cut to fit, in accordance with door manufacturer's warranty requirements.
- .4 Pilot drill screw and bolt holes.

**3.4 Installation - Finishing Hardware**

- .1 Install finishing hardware in accordance with Section 08 71 00.

**3.5 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* instructions.
- .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* instructions.

**END OF SECTION**

Overhead Coiling Grilles

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Overhead coiling grilles.

### **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, operating mechanisms, required clearances and electrical connections.
- .4 Samples: provide samples of each exposed finish.

### **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 rolling grilles for incorporation into operations and maintenance manuals.

### **1.4 Quality Assurance**

- .1 Qualifications: *Provide* work of this section, executed by a *Subcontractor* with experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

### **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.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Aluminum: 6063 alloy, T-5 temper.

### **2.2 Overhead Coiling Grille**

- .1 Acceptable *Products*:
  - .1 Amstel 'ARG159CA'.
- .2 Subject to compliance with *Contract Documents*, acceptable equivalent *Products* of following manufacturers may be used upon approval:

Overhead Coiling Grilles

---

- .1 Cookson.
- .2 Kinnear/Wayne Dalton.
- .3 Substitutions: in accordance with Section 01 25 00.
- .3 Curtain:
  - .1 Construct of 2.5 mm thick x 16 mm wide (0.100" thick x 5/8" wide) aluminum vertical links connected to continuous horizontal 7.9 mm (5/16") diameter aluminum rods.
  - .2 Vertical links shall be secured in place by 11 mm (7/16") diameter aluminum sleeves over every sixth horizontal aluminum rod.
  - .3 Spacing of horizontal aluminum rods shall be 38 mm (1-1/2") on centre. Spacing of vertical aluminum links shall be at 230 mm (9") on centre.
  - .4 Height: as indicated.
- .4 Locking:
  - .1 Members are to be horizontal bottom bars of tubular aluminum extrusion, 50 mm (2") in width and 75 mm (3") in height.
  - .2 Master-keyed cylinders on both sides.
  - .3 Keyed cylinders by Section 08 71 00.
- .5 Guides:
  - .1 Members are to be 35 mm wide x 70 mm deep (1-3/8" wide x 2-3/4") deep extruded aluminum guide sections with built-in upset shoulders to provide curtain retention.
  - .2 Each guide fabricated with bell mouth to provide smooth curtain operation.
  - .3 Each guide shall be complete with steel stoppers to end plates to prevent roll-over and travel above finished bulkhead/soffit.
  - .4 Guides shall be complete with rigid PVC stripping to ensure smooth and quiet operation.
  - .5 Fasten guides to HSS supports and structural angles with concealed fasteners at 610 mm (24") on centre maximum.
- .6 Shaft:
  - .1 Construct of standard pipe of adequate diameter to prevent deflection exceeding 0.76 mm x 305 mm (0.03" per 12") of door width.
  - .2 Shaft shall enclose oil tempered helical torsion springs of a design to ensure proper counterbalancing action with 25% overload factor.
  - .3 Springs shall be mounted on shaped anchors mounted on a single solid torsion rod.
  - .4 Spring tension adjustment shall be by means of an adjusting wheel and pin on the outside of the brackets plate.
- .7 Bracket plates: 4.8 mm (3/16") thick steel plate, prime painted manufacturer's standard grey.

### Overhead Coiling Grilles

---

- .8 Hood: 1 mm (0.04") thick aluminum sheet, press-bent to form suitable coil enclosure.
- .9 Mounting conditions: Above ceiling.
- .10 Operation; manual push-pull operation:
  - .1 Provide attached pull rods.
- .11 Finish:
  - .1 Exposed aluminum: clear anodized.

## **PART 3- EXECUTION**

### **3.1 Preparation**

- .1 Examine supports and other conditions under which closures are to be installed.
- .2 Coordinate with responsible entity to correct unsatisfactory conditions and do not proceed with installation until conditions are corrected.

### **3.2 Installation**

- .1 Materials are to be installed by the manufacturer or an authorized representative. Prior to commencement of the work of this section, examine and be assured that conditions will permit a proper installation.
- .2 Assemble and erect work plumb, true, square, straight, level and accurate to sizes detailed, to reviewed shop drawings, free from distortion and defects detrimental to appearance and performance.
- .3 Isolate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or plaster. Use bituminous paint or butyl tape.
- .4 Supply adequate instructions, templates, and if necessary, supervise installation of the fastenings or accessories requiring to be built-in by work of other sections.

### **3.3 Adjusting and Testing**

- .1 Upon completion of work of this section, clean down material, lubricate and adjust operation as required to obtain optimum performance.

**END OF SECTION**

Side Coiling Grilles

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Side coiling grilles with egress door.

### **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, operating mechanisms, and required clearances.

### **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 grilles for incorporation into operations and maintenance manuals.

### **1.4 Quality Assurance**

- .1 Qualifications: *Provide* work of this section, executed by a *Subcontractor* with experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

### **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.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Aluminum: 6063 alloy, T-5 temper.

### **2.2 Sliding Aluminum Grille**

- .1 Acceptable *Product*:
  - .1 Amstel 'Air Vista AS400CA'.
  - .2 Subject to compliance with *Contract Documents*, acceptable equivalent *Products* of following manufacturers may be used upon approval:
    - .1 Cookson.
    - .2 Dynamic Closures.

### Side Coiling Grilles

---

- .3 Kinnear/Wayne Dalton
- .4 MobilFlex.
- .5 Overhead Door Corporation.
- .3 Substitutions: in accordance with Section 01 25 00.
- .2 Constructed of 152 mm wide x 3.2 mm thick (6" x 0.125") full height aluminum panels. Panels are framed by full height butt hinges on 178 mm (7") centres. Panels are perforated with staggered pattern.
  - .1 Provide adjustable height hardware in top plate allowing up to 25 mm (1") upward or downward height correction without removal of curtain from installed position.
- .3 Curtain height: as indicated.
- .4 Finish, exposed aluminum parts: clear anodized.
- .5 Locking posts: bottom locking intermediate cylinder control.
- .6 Overhead track: Extruded aluminum, 35 mm wide x 41 mm high (1-3/8" x 1-5/8"), with continuous extruded profile seamed together by alignment bars and track pins. Track to accept 28 mm (1-1/8") nylon trolleys and carry weight of complete curtain.
- .7 Operation:
  - .1 Manual push-pull operation.
  - .2 Provide attached pull rods on closures over 2745 mm (9') in height.
- .8 Keyed cylinder by Section 08 71 00, lockable from both sides of grille.
- .9 Emergency egress door: provide fall-away egress door operable by means of thumb-turn.

## PART 3 - EXECUTION

### 3.1 Preparation

- .1 Examine supports and other conditions under which closures are to be installed.
- .2 Coordinate with responsible entity to correct unsatisfactory conditions and do not proceed with installation until conditions are corrected.

### 3.2 Installation

- .1 Materials are to be installed by the manufacturer or an authorized representative. Prior to commencement of the work of this section, examine and be assured that conditions will permit a proper installation.
- .2 Assemble and erect work plumb, true, square, straight, level and accurate to sizes detailed, to reviewed shop drawings, free from distortion and defects detrimental to appearance and performance.
- .3 Isolate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or plaster. Use bituminous paint or butyl tape.
- .4 Supply adequate instructions, templates, and if necessary, supervise installation of the fastenings or accessories requiring to be built-in by work of other sections.

Side Coiling Grilles

---

**3.3 Adjusting and Cleaning**

- .1 Upon completion of work of this section, clean down material, lubricate and adjust operation as required to obtain optimum performance.

**END OF SECTION**

Glass Partitions

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Glass partitions and necessary hardware and related trim for such items.

### **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 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, methods of joining, details of field connections and anchorage, interfacing with other work, fastening and sealing materials and methods.
  - .3 Submit catalogue cuts of manufactured items.
- .4 Samples:
  - .1 Unless otherwise indicated, submit 3 samples for each of the following:
    - .1 150 mm x 150 mm (6" x 6") sample of each metal type and finish.
    - .2 305 mm (12") long samples of top and bottom channels rails for glass wall panels in specified 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.

### **1.5 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors: *Provide* work of this section, executed by competent installers with minimum 5 years experience in application of *Products*, systems and assemblies specified and with training of *Product* manufacturers.

## Glass Partitions

---

### 1.6 Delivery, Storage, and Handling

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off-the-ground, under cover storage locations. Do not load any areas beyond design limits.
- .2 Adequately protect and crate components against damage, dirt, disfigurement and weather.
- .3 Exercise care in handling units to prevent damage and scratched surfaces.
- .4 Deliver glass to the *Place of the Work* in properly packed crates for protection and properly marked for ease of handling.
- .5 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.
- .6 Stacking should be done to prevent bending pressure or abrasion of finished surfaces.
- .7 Mark or flag each pane of glass installed immediately following glass installation. Use temporary coloured tapes or flags suspended near, but not in contact with glass.
- .8 Replace scratched or broken glass damaged due to faulty setting, careless handling or storage at no additional cost to the *Owner*. Additionally, glass which, in opinion of *Consultant*, is seriously distorted shall be replaced at no additional cost to the *Owner*.

## PART 2– PRODUCTS

### 2.1 Manufacturer

- .1 Basis of design:
  - .1 CR Laurence.
- .2 Acceptable alternate manufacturers/installers:
  - .1 C.J. Rush Industries.
  - .2 Inkan Ltd.
  - .3 Surface Solution Industries Inc.

### 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. Design to resist wind, dead, live, and snow loads, in accordance with the building code.
- .3 Design system to receive, accommodate and interface with work of other sections as indicated or required.
- .4 Design installation to provide:
  - .1 Adequate provision for thermal movement without thermal fractures.
  - .2 Adequate provision for live and dead loads, without failure, distortion or fracture.

## Glass Partitions

---

- .3 For differential movement of structural support frame (long term creep and deflection).
- .5 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*.
- .6 Design glass entrances and 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.
- .7 Design light gauge steel structural members in accordance with CAN/CSA S136-07.
- .8 Design to relevant requirements contained in Section 08 44 00.

### 2.3 Partition Systems

- .1 Recessed glazing channels:
  - .1 Base, top, and side rails:
    - .1 Basis of design: CRL 'NH2' or CRL 'NH3' as required to suit glass thickness.
    - .2 Finish: non-clad, satin anodized.
  - .2 *Provide* matching endcaps for partition rails where ends are exposed to view.
- .1 Shower area steam baffle:
  - .1 Basis of design:
    - .1 CRL 'Blumcraft SB200' two piece smoke baffle base shoe'.
    - .1 Finish: satin anodized.

### 2.4 Materials

- .1 Exposed metal and hardware:
  - .1 Extruded aluminum shapes:
    - .1 Extruded aluminum 6063-T5.
  - .2 Bolts, screws and fasteners: Series 300 or 400 stainless steel, cadmium plated.
  - .3 Setting blocks: Neoprene ASTM C542-05(2011), 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: as selected by *Consultant* from full colour range.
    - .3 Acceptable *Products*:
      - .1 Dow Corning '999-A'.
      - .2 Momentive 'SCS1200'.
      - .3 Pecora '860'.
      - .4 Tremco 'Proglaze'.
- .5 Paint: bituminous, conforming to CAN/CGSB 1.108-M89.

## Glass Partitions

---

- .6 Glass retaining member seals: PVC or Neoprene, ASTM C542-05(2011), 70 to 90 Durometer A, Teflon coated, compressible, with corner joints under compression to assure vertical to horizontal neoprene pressure contact.
- .7 Glass:
  - .1 Types: tempered and laminated in accordance with Section 08 88 00.

### 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.
- .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 prior to tempering.

## 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.

Glass Partitions

---

- .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 Manufacturer's field review to be in accordance with Section 01 45 00.

**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**

Aluminum Framed Glazing Systems

---

## **PART 1– GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Aluminum curtain wall.
  - .2 Aluminum skylights.
  - .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.
  - .2 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 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.
  - .2 Shop drawings for skylights shall be engineered by professional engineer qualified in the design of self-supporting glazed systems.
  - .3 Further to requirements of Section 01 33 00, 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

---

- .4 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.
- .5 Include description of materials, metal finishing specifications, and other pertinent information.
- .6 Design loads, typical reactions and support movement allowances, both vertical and horizontal, shall be placed on the shop drawings.
- .7 Shop drawings shall clearly indicate the specification of materials and, where applicable, indicate installation methods and coordination with other sections.
- .8 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:
    - .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.

---

Aluminum Framed Glazing Systems

---

- .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, and skylights 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 and sloped glazing systems. *Subcontractor* shall demonstrate to the acceptance of the *Consultant*, that they have successfully performed on comparable projects over the previous 10 years.
- .2 Aspects of the work of this section are required to be prepared by a professional engineer. Refer to Section 01 33 00 for specific details and requirements in this regard.

#### 1.6 Quality Assurance – Site Assembly Mock-up

- .1 Construct at the *Place of the Work* where directed, a production prototype bay, approximately 3 m (9.8') wide by one full storey unit of curtainwall system, including insulated glass spandrel panel and insulated aluminum panel, in order to identify and solve any problems of assembly, erection, and interfacing which may be encountered under site conditions. To resolve any problems which may occur, correct or remove and rebuild as directed by the *Consultant*. When approved, prototype shall form part of the permanent structure and shall serve as a standard for subsequent work.
- .2 Notify *Owner's* designated inspection company prior to the construction of the prototype to have a representative present.

Aluminum Framed Glazing Systems

---

**1.7 Delivery, Storage, and Handling**

- .1 Store parts in a dry place and permit natural ventilation over their finished surfaces.
- .2 Store materials in locations protected from damage by other trades.
- .3 Under conditions of high humidity or cold temperatures, supply heating or forced air ventilation to prevent accumulation of surface moisture.
- .4 Mark components to show location on building and on drawings.
- .5 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.
- .6 Stacking should be done to prevent bending pressure or abrasion of finished surfaces.

**1.8 Field Conditions**

- .1 Comply with requirements of *Product* manufacturers.

**1.9 Extended Warranty**

- .1 Warrant work of this section in accordance with Section 01 78 36.
  - .1 Special systems warranty: Standard form in which warrantor agrees to repair or replace components and assemblies that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
    - .1 Failures include, but are not limited to, the following:
      - .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 Warranty period:
      - .1 10 years.
  - .2 Special product warranty; glass units: in accordance with Section 08 80 00.
  - .3 Special product warranty; exterior exposed aluminum finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
    - .1 Failures to paint finish include, but are not limited to, the following:
      - .1 Colour fading more than 5 Hunter units when tested according to ASTM D2244-16.
      - .2 Chalking in excess of a No. 8 rating when tested according to ASTM D4214-07(2015).

Aluminum Framed Glazing Systems

---

- .3 Cracking, checking, peeling, or failure of paint to adhere to bare metal.
- .2 Warranty period: 20 years.

## **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.

### **2.2 Glazing System Design - Specific Component Requirements**

- .1 Glass Design:
  - .1 Glass shall be designed according to CAN/CGSB 12.20-M89 and Section 08 80 00.
  - .2 Insulating glass units in accordance with Section 08 80 00.
- .2 Curtainwall:
  - .1 Basis of design:
    - .1 Alumicor 'Thermawall 2600 Series'.
  - .2 Description:
    - .1 Thermally broken sections.
    - .2 Mechanically fasten horizontal and vertical edges of infill materials and glass units with mechanically fastened continuous pressure plates complete with caps.
- .3 Interior aluminum framing:
  - .1 Interior framing; basis of design:
    - .1 Alumicor '3400 Series'.
  - .2 Interior glazed doors (narrow stile) aluminum; basis of design:
    - .1 Alumicor 'Canadiana Series 100A'.
- .4 Aluminum entrances, screens, and framing:
  - .1 Acceptable entrance framing products:
    - .1 Interior entrance framing; basis of design:
      - .1 Alumicor '3400 Series'.
    - .2 Exterior entrance framing; basis of design:
      - .1 Curtainwall framing as specified above.

Aluminum Framed Glazing Systems

---

- .3 Interior doors (narrow stile) aluminum; basis of design:
  - .1 Alumicor 'Canadiana Series 100A'.
- .4 Exterior doors (narrow stile) glass faced aluminum SSG; basis of design:
  - .1 Alumicor 'Insuldoors 400A'.
- .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, complete with EPDM blade gasket sweep strip applied to the bottom door rail with concealed fasteners.
  - .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.
- .5 Aluminum skylights (sloped glazing (tilted greater than 15 degrees from vertical)):
  - .1 Basis of design:
    - .1 IBG Canada Ltd., thermally broken SSG with perimeter caps.
  - .2 Description:
    - .1 Skylight framing shall be designed and constructed to be self-supporting between the supports. Skylights will impose reactions to the support construction. Adjacent and support construction shall support the transfer of loads including horizontal and vertical, exerted by skylights.
    - .2 Construct skylight using continuous aluminum curb with expansion joints as required.
    - .3 Insofar as practicable, fit and assemble work in the manufacturer's shop. Work which cannot be permanently assembled shall be shop-assembled, marked, and disassembled before shipment to the jobsite.
    - .4 Design rafter bars for slide-in type spline glazing strips.
    - .5 Shop locate, drill, and bolt, or weld aluminum clips to framing members.
    - .6 Set glass with interior and exterior EDPM glazing strips.
    - .7 Use setting blocks to support glass and to provide edge clearances and glass bites as outlined below, in accordance with FGMA recommendations:
      - .1 Set blocks not less than 150 mm (6") from edge of glass for support unit.
      - .2 Glass bite: Not less than 12.7 mm (1/2") nor more than 16 mm (5/8") on any side of glass unit.
      - .3 Maintain 6 mm (1/4") edge clearance between glass and adjacent metal framework.
      - .4 Use rubber spacers to maintain separation of glass and adjacent metal framework.

### Aluminum Framed Glazing Systems

---

- .8 Locate insect proof weep holes in curb to positively drain condensation to exterior of skylight at each rafter connection.
- .9 Fasteners connecting and fixing the window frame members shall be concealed.
- .10 Weep water channels to drain weep water to exterior of building envelope.
- .11 Condensation channels to collect condensation for re-evaporation to interior.

## 2.3 Performance/Design Requirements - General

- .1 Unless specified otherwise, glazing systems shall be designed to the following standards and references:
  - .1 IGMA 'North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use'.
  - .2 GANA 'Glazing Manual'.
  - .3 GANA 'Sealant Manual'.
  - .4 American Architectural Manufacturers Association (AAMA).
- .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.
- .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 The *Work* shall be designed 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.

## 2.4 Performance/Design Requirements - Structural

- .1 Design components to the relevant sections of the building code, using limit states design methods.

Aluminum Framed Glazing Systems

---

- .2 Glass units shall withstand thermal stresses. Base thermal stress calculations on the use of roller shades mounted not less than 64 mm (2-1/2") from the inside face of glass units and slab edge pocket as indicated. Glass units shall also withstand thermal stresses created by shadowing of exterior components or assembly and elevated interstitial space temperatures. Glass thermal stress analysis to be provided as formal submittal.
- .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 above stated profiles. 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.
  - .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 Aluminum framing members shall be designed according to 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, 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 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.

Aluminum Framed Glazing Systems

---

- .8 Design structural steel structural components and fasteners in accordance with CSA-S16-09.
- .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.
- .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.

## **2.5 Performance/Design Requirements - Air Infiltration and Water Resistance**

- .1 Air infiltration rate:
  - .1 Fixed glazing: Maximum 0.1 L/s/m<sup>2</sup> (0.02 cfm/ft<sup>2</sup>) of glazing area when tested in accordance with ASTM E283-04(2012) at test pressure of 300 Pa (6.24 psf).
  - .2 Single entrance doors: Maximum 2.54 L/s/m<sup>2</sup> (0.5 cfm/ft<sup>2</sup>) when tested in accordance with ASTM E283-04(2012), at a pressure differential of 75 Pa (1.57 psf).
  - .3 Paired entrance doors: Maximum 5.08 L/s/m<sup>2</sup> (1.0 cfm/ft<sup>2</sup>) when tested in accordance with ASTM E283-04(2012), at a pressure differential of 75 Pa (1.57 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(2016), 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 (6.24 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.

### Aluminum Framed Glazing Systems

---

- .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 Insulating performance of aluminum framed glazing systems including framing effects:
  - .1 Double glazed units; overall winter and summer U-value (imperial): 2.11 (0.37).
  - .2 Triple glazed units; overall winter and summer U-value (imperial): 1.33 (0.23).
- .2 No condensation or frost shall form on the interior of glazing or framing members when tested under the following conditions:
  - .1 Typical: 22°C, 35% R.H.
  - .2 Aquatic Hall: 29°C, 65% R.H.
  - .2 Exterior air -20°C, 24 km/h (15 ml/h) wind speed.
- .3 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.
- .4 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 ASTM B221-14: 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:
      - .1 ASTM B209-14: AA3003-H14 Painting Quality.

Aluminum Framed Glazing Systems

---

.2 ASTM B209-14: AA5052-H32 Painting Quality.

.4 Aluminum sheet panels:

.1 Minimum wall thickness: 3 mm (0.125").

.1 2.1 mm (0.080") minimum thickness for aluminum facer panels at shadowbox assemblies.

.2 Surface flatness: 0.38 mm (0.015") maximum deviation when measured with 150 mm (6") rule.

.3 Squareness: 0.05 mm (0.002") maximum for each 25.4 mm (1") of length at panel edge.

.4 Aluminum alloy:

.1 For painted finish:

.1 ASTM B209-14: 3003H14.

.5 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.

.6 Air seal gaskets; between unitized glazing assemblies: Silicone or silicone compatible EPDM sheet with Durometer hardness between 50 to 60 or alternate approved by *Consultant*.

.7 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 Dow Corning 'Silicone Transition System'.

.2 Tremco 'Proglaze ETA Engineered Transition Assembly'.

.3 Momentive 'Ultraspan US 1100'.

.8 Fasteners:

.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.

.6 For glazing assemblies at pool enclosures: Zinc-coated steel complying with ASTM B633-15 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated

### Aluminum Framed Glazing Systems

---

- .9 Anchors: Three-way adjustable anchors with minimum adjustment of that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - .1 Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M-09 or ASTM A153/A153M-09 requirements.
- .10 Sheet metal backpans and air barriers: 0.91 mm (0.036") (20 gauge) thickness, galvanized sheet steel to ASTM A653/A653M-11 , Designation G90/Z275.
  - .1 Fasteners: Corrosion resistant, zinc plated, covered and sealed to sheet metal with silicone sealant.
- .11 Dielectric separator: Non-staining alkali resistant, rubber isolation pads or 10 mil vinyl membrane type, electrolytic isolation factor of 1.0.
- .12 Internal sealant and air barrier sealant: One-part, neutral cure, high performance silicone sealant complying with ASTM C920-11, Type S, Grade NS, Class 25, capable of sustaining dynamic movements, SWRI sealant validated.
- .13 Zinc-rich coating: Touch-up paint for welded galvanized areas; 2 coats of zinc-rich paint to CAN/CGSB 1.171-98, VOC <340 g/L.
- .14 Thermal break 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, 6 mm (1/4") minimum thickness.
  - .2 Glass fibre reinforced polyamide porthole extrusion providing full separation of interior and exterior components. Thickness shall be as required to meet design, 6 mm (1/4") minimum thickness.
- .15 Miscellaneous steel: CSA G40.21-04, 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 to AAMA 2605-13.
  - .1 Acceptable *Products*:
    - .1 PPG 'Duranar XL'.
    - .2 Valspar 'Fluorpon Classic'.
  - .2 Colour:

Aluminum Framed Glazing Systems

---

- .1 Colour to later selection by *Consultant* from manufacturer's full range. Colour shall be:

- .1 Solid.

- .2 Finish exposed metal fasteners: baked-on finish to match related aluminum surfaces.
- .3 Finish steel clips and reinforcing steel with 380 g/m<sup>2</sup> (13.4 oz/ft<sup>2</sup>) zinc coating to CAN/CSA G164-M92.

## 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 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 glazing 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 Form flashing bends with clean, straight, sharply defined profiles without damage and discolouration to finish.
- .13 Extrusion thickness shall be adequate to satisfy loading and deflection, as required and indicated.

Aluminum Framed Glazing Systems

---

- .14 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.
- .15 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.
- .16 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.
- .17 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.
- .18 Trim glazing spline at continuous embedded sill flashing locations (to ensure full upturn of flashing) behind pressure plate.
- .19 Include thermal barriers, and miscellaneous neoprene pads, shims and washers.
- .20 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.
- .21 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.
- .22 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 center line of mullions when required.

## **2.10 Fabrication - Aluminum Sheet Panel Construction**

- .1 Fabricate aluminum sheet panel systems complete with continuous recesses to profiles and sizes shown, and to specified tolerances.
- .2 Systems shall be designed and fabricated using non-cumulative, concealed attachment methods.
- .3 Anchorage: Allow for expansion and contraction.
- .4 Include cold rolled framing, furring, brackets, clips, hangers and incidental components as required for secure fastening and provide weathertight installation including non-corrosive fasteners.

Aluminum Framed Glazing Systems

---

- .5 Allow for condensation and inner wall drainage at sill members and other shapes which would otherwise tend to trap water.
- .6 Lay out panels to obtain uniform metal and paint grain finish. Mark direction of metal grain and paint application on back of panels.

## **2.11 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.

## **2.12 Fabrication - Metal Air Barrier**

- .1 Brake form barrier from sheet metal to permit assembly using self-tapping screws, and attachment using powder-activated or pneumatic fixings or other means of secure fastening.
- .2 Make provision in barrier design to accommodate movement resulting from thermal change and from structural deflection.
- .3 Form edges to 45° angle to permit peripheral and joint sealing.
- .4 Cut, fit and form metal air barriers as required to accommodate conflicting framing connections, mechanical and electrical appurtenances and other obstructions.

## **2.13 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 Panels:
    - .1 Bow: 0.2% of panel dimensions up to 3.2 mm (1/8") maximum.
    - .2 Indicated size:

Aluminum Framed Glazing Systems

---

- .1 Up to 1220 mm (48"): 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 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, 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. 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.

### Aluminum Framed Glazing Systems

---

.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 (48"): 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.

### 3.3 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.

.2 Wherever practicable, factory install glass associated with doors of this section in accordance with requirements stipulated under Section 08 80 00, except as otherwise indicated herein.

### 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 Finishing Hardware - Installation

.1 Install finishing hardware in accordance with Section 08 71 00.

### **3.9 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.
  - .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*.
- .4 Submit written certification by a Professional Engineer registered in *Place of the Work* stating that the glazing systems have been designed in accordance with design and performance requirements specified. The professional engineer shall satisfy itself that the manufacture and erection of the glazing systems are in accordance with his design. Periodic inspection by the Professional Engineer during erection will be required.

### **3.10 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 all 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.

Aluminum Framed Glazing Systems

---

- .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

### 3.11 Field Quality Control – Field Testing of Skylights

- .1 The *Owner* will engage the services of an independent inspection and testing company to conduct testing of the installed work.
  - .1 Field testing will be paid in accordance with Section 01 45 00.
- .2 At the discretion and as directed by *Consultant*, testing may be performed prior to installation of exterior sealants in order to assess the integrity of drainage systems and seals at frame joints. Skylight system in this nearly completed state shall not experience water leakage. Testing in this alternate configuration shall be performed at ambient air pressure on both sides of the specimen. Evidence of water leakage shall be deemed a failure and remedial work shall be performed to correct the deficiency and shall then be re-tested. At the discretion of the *Consultant*, further testing requirements may be waived once this modified testing yields a pass, and deem the installation to be compliant with specifications.
- .3 The *Subcontractor* is responsible for alterations, repairs, additions necessary to achieve acceptable performance at the test locations and similar adjustments to completed work.
- .4 Water Spray Test: Before installation of interior finishes has begun, areas designated by *Consultant* shall be tested according to AAMA 501.2-09 and shall not evidence water penetration.
- .5 Water supply to the skylights, with adequate water pressure, is to be provided by *Contractor*.
- .6 Tests shall be conducted upon completion of the installation with no remobilization or down time included to accommodate either water supply availability or witness personnel schedules.
- .7 Testing shall be performed by the skylight manufacturer's authorized personnel and witnessed by independent inspection agency and *Consultant*.
- .8 Glazed aluminum skylight systems will be considered defective if they do not pass tests and inspections.

### 3.12 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.
- .2 Remove non-permanent labels.
- .3 Remove dirt and residue from surfaces.

Aluminum Framed Glazing Systems

---

- .4 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*.
- .5 Wash exposed surfaces with a cleaning solution approved by *Product* manufacturers.

**3.13 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**

**PART 1 – GENERAL**

**1.1 Related Work**

- |    |                         |  |
|----|-------------------------|--|
| .1 | <b>Section 08 11 00</b> | Metal Doors & Frames   |
| .2 | <b>Section 08 11 16</b> | Aluminum Doors & Frames  |
| .3 | <b>Section 08 14 16</b> | Flush Wood Doors   |
| .4 | <b>Section 08 44 13</b> | Glazed Aluminum Curtain Walls & Windows  |
| .5 | <b>Division 26</b>      | Electrical Wiring for and hook-up of all electrical hardware specified in this section |
| .6 | <b>Division 28</b>      | Electronic Safety and Security: Card Readers   |

**1.2 Reference Standards**

- |     |   |
|-----|---|
| .1  | Standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers Association. |
| .2  | ANSI/BHMA A156.2-2011, Bored & Preassembled Locks and Latches.  |
| .3  | ANSI/BHMA A156.1-2013, Butts and Hinges.  |
| .4  | ANSI/BHMA A156.3-2014, Exit Devices.  |
| .5  | ANSI/BHMA A156.4-2013, Door Controls - Closers.   |
| .6  | ANSI/BHMA A156.5-2014, Cylinders and Input Devices for Locks.   |
| .7  | ANSI/BHMA A156.6-2010, Architectural Door Trim.   |
| .8  | ANSI/BHMA A156.7-2014, Template Hinge Dimensions.   |
| .9  | ANSI/BHMA A156.8-2010, Door Controls – Overhead Stops & Holders.  |
| .10 | ANSI/BHMA A156.13-2012, Mortise Locks and Latches.  |
| .11 | ANSI/BHMA A156.15-2011, Release Devices - Closer/Holder.  |
| .12 | ANSI/BHMA A156.16-2013, Auxiliary Hardware.   |
| .13 | ANSI/BHMA A156.18-2012, Materials and Finishes.   |
| .14 | ANSI/BHMA A156.19-2013, Power Assist & Low Energy Power Operated Doors.   |
| .15 | ANSI/BHMA A156.26-2012, Continuous Hinges.  |

- .16 ANSI/BHMA A156.21-2014, Thresholds.
- .17 ANSI/BHMA A156.22-2012, Door Gasketing.
- .18 ANSI/BHMA A156.25-2013, Electrified Locking Devices.
- .19 ANSI/BHMA A156.29-2013, Exit Locks with Alarms, Exit Alarms, Alarms for Exits.

### 1.3 Requirements

#### Regulatory Agencies

- .1 Hardware for doors in fire separations and exit doors to be certified by ULI / ULC, a Canadian Certification Organization accredited by Standards Council of Canada.

### 1.4 Samples

- .1 When requested, submit samples of hardware items in accordance with Section 01340 - Shop Drawings, Product Data, Samples and Mock-ups.
- .2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
- .3 After approval, samples will be returned for incorporation in the Work.

### 1.5 Hardware Schedule

- .1 Submit contract hardware schedule using the standard DHI format for finish hardware schedules in accordance with Section 01340 – Shop Drawings, Product Data, Samples and Mock-ups.
- .2 Clearly indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

### 1.6 Maintenance Data

- .1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit devices for incorporation into manual specified in Section 01730 – Operation and Maintenance Manual.
- .2 Brief maintenance staff regarding proper care, cleaning and general maintenance of door hardware items.

### 1.7 Maintenance

#### Materials

- .1 Provide maintenance materials in accordance with Section 01720.
- .2 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

### 1.8 Delivery and

#### Storage

- .1 Store finishing hardware in locked, clean and dry area.
- .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

## PART 2 – PRODUCTS

### 2.1 Hardware Items

- .1 Use one manufacturer's products only for all similar product groups.

- .2 The product numbers listed in the finish hardware schedule are to be used as the standard of acceptance for all items and are from the following group of manufacturers:
- |   |            |
|---|------------|
| Full Mortise Hinges   | Ives       |
| Continuous Hinges   | Ives       |
| Locksets, Latchsets   | Schlage    |
| Mortise and Rim Cylinders   | Sargent    |
| Exit Devices, Trims, Elect. Strikes   | Von Duprin |
| Door Closers  | LCN        |
| Lock Guards, Door Pulls/Push Bars   | Ives       |
| Floor/Wall Stops, Flush Bolts   | Ives       |
| Pushes & Pulls, & Kickplates  | Ives       |
| Thresholds, Sound Seal, Door Bottoms & Sweeps, Astragals & Weatherstripping | Draft Seal |
- .3 Other manufacturer's products will be considered for some of the products, provided they meet or exceed the performance, grade, quality, function, weight, design and finish of the specified product, and requests for approval are approved by the consultant in writing through issued addendums seven (7) days prior to tender closing.

## 2.2 Door Hardware

- .1 Butts and hinges:
- .1 Butts and continuous hinges: designated by letter and numeral identifiers, followed by size and finish, as listed in Hardware Schedule.
  - .2 Self-closing hinges and pivots: designated by letter and numeral identifiers as listed in Hardware Schedule.
  - .3 Butt hinges on exterior doors and locked doors opening out shall have non removable pins (NRP) and doors equipped with door closers or in high traffic areas shall have ball bearing (BB) hinges.
  - .4 Continuous hinges shall be heavy duty full mortise aluminum geared type, providing full height door support with minimum of 32 bearings for quiet, smooth and self-lubricating operation. Hinge material to be 6063-T6 aluminum, and each hinge shall be able to hold a door up to 450 lbs, and to door width of 4'0". Finish to be as listed in hardware schedule.
  - .5 Specified product - butt hinges: Ives  
Specified product - continuous hinges: Ives
- .2 Locks and latches:
- .1 Mortise locks and latches: to ANSI/BHMA A156.13-1994, Series 1000 mortise lock, Grade 1 operational and Grade 1 security, ULC Listed for A label doors, with all functions available in one size case;
  - .2 Mortise locks shall have a full ¾" throw two-piece mechanical anti-friction latchbolt, a one-piece stainless steel 1" throw deadbolt, and handing of locks shall be reversible without disassembly of the lockcase.
  - .3 Lever Handles: Schlage # 03 Design, Solid Cast Tubular design, Forged, complete with return to door.
  - .4 Roses or Escutcheons: Round design "A" as listed in schedule.
  - .5 Normal strikes: ASA type, lip standard projection except where noted.
  - .6 Cylinders: Standard Core, GMK'd as listed in schedule.
  - .7 Finish to be Satin Chromium Plated 626.

- .8 Specified products: Locksets - Schlage Lock
- .3 Locks and latches:
  - .1 Mortise deadlocks: to ANSI/BHMA A156.13-1994, Series 1000 mortise lock, grade 1, designed for function and keyed as stated in Hardware Schedule.
  - .2 All deadlocks shall have high strength steel alloy cylinder retainer, armored front adjustable for door bevel, 1" stainless steel throw deadbolt, and heavy duty ADA compliant thumb turns.
  - .3 Normal strikes: ANSI, standard deadbolt strikes.
  - .4 Finish to be Satin Chrome 626.
  - .5 Cylinders: Standard Core, GMK'd as listed in schedule.
  - .6 Specified product: Schlage
- .4 Exit Devices:
  - .1 to be heavy duty, grade 1, modern design push bar style, wide or narrow stile, to meet ANSI, ULC, NFPA and ADA certification, to have thru-bolted trim, heavy-duty steel I-beam bar, and heavy gauge latch head with reinforced bracket. All lever trims to be free-wheeling, vandal-resistant, and all devices to have deadlocking latchbolts.
  - .2 Finish to be Satin Chrome 626, as listed in Hardware Schedule. Functions and trims (03) to be as listed in Hardware Schedule.
  - .3 Specified product: Von Duprin
- .5 Door Closers and Accessories:
  - .1 Door controls (closers): to meet or exceed ANSI A156.4 Grade 1 requirements; to be heavy duty cast iron or aluminum bodies with adjustable spring power and have separate valves for latching, closing and backcheck control. All closer arms to be forged steel with power adjustment arm bracket.
  - .2 All closers are to be non-sized to suit door and opening, and to have full covers with finish 689. Brackets, shoes, and plates are to be included for proper mounting of closers. All closers shall have minimum 25 - year warranty.
  - .3 Specified product: LCN
- .6 Overhead stops/holders:
  - .1 Door controls (overhead stops/holders): to meet or exceed ANSI A156.8 Grade 1 requirements; to be heavy duty slide track type with heavy duty shock absorber spring and non-metal slide block and shock block, non-handed.
  - .2 to be Type 304 stainless steel material in stainless steel 630 finish.
  - .3 Specified product: Glynn-Johnson
- .7 Auxiliary locks:
  - .1 to meet ANSI A156.16 -1989 requirements, to be heavy-duty and finished in 626.
  - .2 Cylinders: Standard Core rim or mortise type, finished to 626, for installation in deadlocks on special doors as listed in Hardware Schedule.
  - .3 Specified product: Sargent – No substitution
- .8 Architectural door trim:
  - .1 to meet ANSI A156.6-1994 requirements, type 304 stainless steel, finished 630.
  - .2 Door protection plates: kick plate type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.
  - .3 Push plates: type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.
  - .4 Push/Pull units: type 304 stainless steel, 1" thick stainless steel, finished to 630.

- .3 Specified product: Ives Hardware
- .9 Auxiliary hardware; electric strikes:
  - .1 to meet ANSI A156.5-1992 Grade 1 requirements, to meet ULC, Burglary-Resistant and Fire Door and Frame certifications. Finish to be 630.
  - .2 Electric Strikes shall be all stainless steel construction, non-handed, and be fail secure or fail-safe, as listed, with adjustable strike box and two-piece plug connectors.
  - .3 Specified product: Von Duprin
- .10 Door bottom seal:
  - .1 Heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted, adjustable, automatic retract mechanism when door is open, clear anodized finish.
  - .2 Specified product: Draft Seal
- .11 Thresholds:
  - .1 100/127mm wide x full width of door opening, extruded aluminum, serrated surface, with thermal break of rigid PVC, clear anodized finish.
  - .2 Specified product: Draft Seal
- .12 Weatherstripping:
  - .1 Head and jamb seal:
    - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
    - .2 Adhesive backed santoprene material.
  - .2 Door bottom seal:
    - .1 Extruded aluminum frame and closed cell neoprene, one inch drop, automatic closing mechanism, clear anodized finish.
  - .3 Specified product: Draft Seal
- .13 Astragals:
  - .1 adjustable, compensating, extruded aluminum frame with pile insert, clear anodized finish.
  - .2 Specified product: Draft Seal

### 2.3 Fastenings

- .1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .2 Exposed fastening devices to match finish of hardware.
- .3 Use fasteners compatible with material through which they pass.

### 2.4 Keying

- .1 All mortise locksets, deadlocks, and exit device trims to have standard core mortise or rim cylinders to suit, and be keyed to the existing Sargent master key system registered for Lloyd Matheson Center – Municipality of East Hants. Doors, padlocks and cabinet locks to be keyed differently, keyed alike, keyed alike in groups, master keyed or grandmaster keyed as directed. Prepare detailed keying schedule in conjunction with owner's representative.

- .2 Provide one (1) Wall Mounted Key Cabinet and Dual key control system, 100 key capacity, to suit number of locks and cylinders on project.

### PART 3 – EXECUTION

#### 3.1 Installation Instructions

- .1 Furnish metal door and frame manufacturer's with complete instructions and templates for preparation of their work to receive hardware.
- .2 Furnish manufacturer's instructions for proper installation of all hardware components.
- .3 Install hardware to standard hardware location dimensions in accordance with Canadian Imperial Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .4 Where door stop contacts door pulls, mount stop to strike bottom of pull.

#### 3.2 SCHEDULE

Set #H-1 Pair Doors 001; Each to have:

8 Hinges Ives 5BB1HW 5 x 4 ½ NRP - 630  
1 Conc. V/R Exit Devices Von Duprin RX-E-9847L x E996L-03AM x LD - 626AM  
1 Conc. V/R Exit Devices Von Duprin RX-9847EO x LD - 626AM  
1 Rim Cylinder Sargent 34 x GMK'd - 32D  
2 Door Closers LCN 4040XP HEDA x T/B - 689  
2 Kick Plates Ives 8400B4E-250 x 950 - 630  
2 Wall Stops Ives WS406CVX - 630  
1 Threshold DraftSeal DS177X5TBN x 2000 - AL  
1 Set Door Seal DraftSeal DS118C x 6700 - AL  
2 Door Sweeps DraftSeal DS138C x 1000 - AL  
1 Set Astragals DraftSeal DS151C/DS151CP x 2350 - AL  
1 Power Supply Schlage PS902 x 900-8F x 900-BBK  
2 Electric Power Transfers EPT10 - SP28  
2 Door Position Switches GE Interlogix # 1076D DPDT UL - G  
Card Reader & Controller supplied by Access Control Section

Set #H-2 Single Door 002, ; Each to have:

3 Hinges Ives 5BB1HW 4 ½ x 4 ½ - 630  
1 Mortise Lockset Schlage L9080L - 03/A - 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Door Closer LCN 4050 Hw/PA-REG x T/B - 689  
1 Kick Plate Ives 8400B4E-250 x 950 - 8401 TAPE - 630  
1 Floor Stop Ives FS439 - 626  
1 Set Door Seal DraftSeal DS44D x 5300 - BN  
1 Door Sweep DraftSeal DS149C x 1000 - AL

Set #H-3 Single Doors 003, 009; Each to have:

3 Hinges Ives 5BB1HW 4 ½ x 4 ½ - 630  
1 Mortise Passage Set Schlage L9010 - 03/A - 626AM

1 Door Closer LCN 4050 SCUSH x T/B - 689  
1 Kick Plate Ives 8400B4E-250 x 950 - 630  
1 Set Door Seal DraftSeal DS44D x 5300 - BN  
1 Door Sweep DraftSeal DS149C x 950 - AL

Set #H-4 Single Doors 004, 145, 146; Each to have:

3 Hinges Ives 5BB1HW 4 ½ x 4 ½ - 652  
1 Exit Device Von Duprin 9875L-BE-F x 996L-BE-M-03AM - 626AM  
1 Door Closer LCN 4050 Hw/PA-REG x T/B - 689  
1 Kick Plate Ives 8400B4S-250 x 950 x 8401 TAPE - 630  
1 Floor Stop Ives FS439 - 626  
1 Set Door Seal DraftSeal DS44D x 5300 - BN  
1 Door Sweep DraftSeal DS149C x 950 - AL

Set #H-5 Pair Doors 005; Each to have:

6 Hinges Ives 5BB1 4 ½ x 4 - 652  
1 Set Constant Latching Flush Bolts Ives FB51P x LHR Dr. - 630  
1 Mortise Passage Set Schlage L9010 - 03/A x RHR Dr. - 626AM  
2 Door Closers LCN 4050 Hw/PA-REG x T/B - 689  
2 O/H Door Stops/Holders Glynn-Johnson 904H - 630  
1 Set Door Seal DraftSeal DS44D x 6130 - BN  
2 Door Sweeps DraftSeal DS138C x 915 - AL  
1 Set Astragals DraftSeal DS151C/DS151CP x 2150 - AL  
1 Door Coordinator Ives COR7G x Carry Bar CB1 - 626

Set #H-6 Single Doors 006, 007, ; Each to have:

4 Hinges Ives 5BB1HW 5 x 4 ½ - 630  
1 Mortise Lockset Schlage L9080L - 03/A - 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Door Closer LCN 4050 SCUSH x T/B - 689  
1 Set Door Seal DraftSeal DS44D x 5300 - BN  
1 Door Sweep DraftSeal DS149C x 1000 - AL

Set #H-7 Pair Doors 101; Each to have:

2 Continuous Hinges Ives 112HD x 90" - Custom CTL x EPT Prep - 628  
1 Conc. V/R Exit Device Von Duprin RX-QEL3547NL-OP x 388 x 4' dr.(LHR Dr.) - 626AM  
1 Conc. V/R Exit Device Von Duprin RX-QEL3547EO x 4' dr. (RHR Dr.) - 626AM  
1 Rim Cylinder Sargent 34 x GMK'd - 32D  
2 Door Pulls Ives 9264F-72 x 72" O/A length x Conc. Mtg. Type "H&I" - 630AM  
1 Automatic Door Operator – Refer to Section 08 71 13  
2 Actuator Buttons – Refer to Section 08 71 13  
1 Bollard Post – Refer to Section 08 71 13  
1 Advanced Logic Relay Switching Network Camden CX-33

1 Door Closer LCN 4040XP-REG T/J (RHR Dr.) - 689  
1 Mounting Plate LCN 4040XP-18G - 689  
2 Conc. O/H Door Stops/holders Glynn-Johnson 105H x 90 degrees DS - C32D  
1 Threshold DraftSeal DS501TB x 2000 - AL  
1 Power Supply Schlage PS904 x 900-2RS x 900-BBK x 900-KL (2 doors)  
2 Electric Power Transfers EPT10 - SP28  
2 Door Position Switches GE Interlogix # 1076D DPDT UL - G  
Door seal, astragals, and sweeps supplied by door supplier  
Card Reader & Controller supplied by Access Control Section

Set #H-8 Pair Doors 102; Each to have:

2 Continuous Hinges Ives 112HD x 90" - Custom CTL - 628  
2 Dummy Push Bars Von Duprin 350 x 4' dr. - 626AM  
2 Door Pulls Ives 9264F-72 x 72" O/A length x Conc. Mtg. Type "H&I" - 630AM  
1 Automatic Door Operator – Refer to Section 08 71 13  
2 Actuator Buttons – Refer to Section 08 71 13  
1 Door Closer LCN 4040XP REG-T/J x T/B (RHR Dr.) - 689  
1 Mounting Plate LCN 4040-18G - 689  
2 Conc. O/H Door Stops/holders Glynn-Johnson 105H x 90 degrees - C32D  
Door seal and sweeps supplied by door supplier

Set #H-9 Pair Doors 103; Each to have:

2 Continuous Hinges Ives 112HD x 90" - Custom CTL x EPT Prep - 628  
1 Conc. V/R Exit Device Von Duprin RX-QEL3547NL-OP-LD x 388 - 4' dr.(RHR Dr.) - 626AM  
1 Conc. V/R Exit Device Von Duprin RX-3547EO-LD x 4' dr. (LHR Dr.) - 626AM  
1 Rim Cylinder Sargent 34 x GMK'd - 32D  
2 Door Pulls Ives 8190HD-2 x 12" x 1" OD x Type "L" Conc. Mtg. - 630AM  
2 Door Closers LCN 4040XP-REG T/J Mtng. - 689  
2 Mounting Plates LCN 4040XP-18G - 689  
2 Conc. O/H Door Stops/holders Glynn-Johnson 105H x 95 degrees DS - C32D  
1 Threshold DraftSeal DS501TB x 2000 - AL  
1 Power Supply Schlage PS904 x 900-2RS x 900-BBK x 900-KL (2 doors)  
2 Electric Power Transfers EPT10 - SP28  
2 Door Position Switches GE Interlogix # 1076D DPDT UL - G  
Door seal, astragals, and sweeps supplied by door supplier  
Card Reader & Controller supplied by Access Control Section

Set #H-10 Pair Doors 104; Each to have:

2 Continuous Hinges Ives 112HD x 90" - Custom CTL x EPT Prep - 628  
1 Conc. V/R Exit Device Von Duprin RX-QEL3547NL-OP-LD - 4' dr.(RHR Dr.) - 626AM  
1 Conc. V/R Exit Device Von Duprin RX-3547EO-LD x 4' dr. (LHR Dr.) - 626AM  
1 Rim Cylinder Sargent 34 x GMK'd - 32D  
2 Door Pulls Ives 8190HD-2 x 12" x 1" OD x Type "L" Conc. Mtg. - 630AM  
2 Door Closers LCN 4040XP-REG T/J Mtng. - 689  
2 Mounting Plates LCN 4040XP-18G - 689

2 Conc. O/H Door Stops/Holders Glynn-Johnson 105H x 95 degrees - C32D  
1 Threshold DraftSeal DS501TB x 2000 - AL  
1 Power Supply Schlage PS904 x 900-2RS x 900-BBK x 900-KL (2 doors)  
2 Electric Power Transfers EPT10 - SP28  
2 Door Position Switches GE Interlogix # 1076D DPDT UL - G  
Door seal, astragals, and sweeps supplied by door supplier  
Card Reader & Controller supplied by Access Control Section

Set #H-11      Single Door M102.1 ; Each to have:

4 Concealed Hinges Soss #216 - US26D  
1 Deadbolt Schlage B560BDC x SFIC Cyl. – Sargent - 626  
1 Cupped Magnet Set Lee Valley 99K39.07  
1 Edge Door Pull Richelieu BP46037010

Set #H-12      Single Door M106.1 ; Each to have:

1 Length Continuous Piano Hinge Larsen & Shaw 1116J03NP x 24”  
2 Ball Catches Ives 349 - 626

Set #H-13      Single Door M106.2 ; Each to have:

4 Concealed Hinges Soss #208 - US26D  
1 Cabinet Door Lock Schlage CL721G-L x SFIC Cyl. – Sargent - 626  
1 Cupped Magnet Set Lee Valley 99K39.05  
1 Edge Door Pull Richelieu BP46037010

Set #H-14      Single Door 110, ; Each to have:

3 Hinges Ives 5BB1HW 5 x 4 ½ NRP - 630  
1 Exit Device Von Duprin RX-9875L-NL x 996L-NL-M-03AM - 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Door Closer LCN 4040XP SCUSH x T/B - 689  
1 Threshold DraftSeal DS177X5TBN x 1000 - AL  
1 Set Door Seal DraftSeal DS118C x 5700 - AL  
1 Door Sweep DraftSeal DS138C x 1000 - AL  
1 Electric Power Transfer EPT10 - SP28  
1 Electric Strike Von Duprin 6400-FSE x 12/24V - 32D  
1 Power Supply Schlage PS902 x 900-8F x 900-BBK  
1 Door Position Switch GE Interlogix # 1076D DPDT UL - G  
Card Reader & Controller supplied by Access Control Section

Set #H-15      Single Door 111, ; Each to have:

4 Hinges Ives 5BB1HW 5 x 4 ½ NRP - 630  
1 Mortise Lever Lockset Schlage LV9485L-03 x 283-722 Indicator – 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D

1 Automatic Door Operator – Refer to Section 08 71 13  
1 Actuator Switch – Refer to Section 08 71 13  
1 Kickplate Ives 8400B4E 250mm x 864mm - 630  
1 O/H Door Stop Glynn-Johnson 905S x 90 Degrees - 630  
1 Threshold DraftSeal DS501TB x 1000 - AL  
1 Set Door Seal DraftSeal DS44D x 5700mm - BN  
1 Door Sweep DraftSeal DS135C x 1000 - AL  
1 Electric Strike HES 1006CS-T Fail Safe x 24 V - 630  
1 Restroom Control Kit Camden CX-WC13FM – to include: CX-33 Advanced Logic Control, CM-45/8/GRFSE1 4 ½” Illuminated Push Plate Switch (PUSH TO LOCK), with sign, CM-45/4/GRFSE1 4 ½” Illuminated Push Plate (Wheelchair symbol and PUSH TO OPEN), with sign, CX-MDC Magnetic Door Contact  
1 Single Gang “Occupied” LED Annunciator Camden CM-AF500 - 630  
NOTE: Wiring, conduit, and hook-up by Section 26 - Electrical

Set #H-16 Pair Doors 112; Each to have:

2 Continuous Hinges Ives 112HD x 90” - Custom CTL x EPT Prep - 628  
1 Conc. V/R Exit Device Von Duprin SS-E-3547L-BE-LD x E360L-BE-FSE - 4’ dr.(RHR Dr.) - 626AM  
1 Conc. V/R Exit Device Von Duprin SS-3547EO x 4’ dr. x EEO Signs (2) (LHR Dr.) - 626AM  
3 Mortise Cylinders Sargent 42 x GMK’d x #106 cam to suit - 32D  
2 Door Closers LCN 4040XP-REG T/J (RHR Dr.) - 689  
2 Mounting Plates LCN 4040XP-18G - 689  
2 Conc. O/H Door Stops/holders Glynn-Johnson 105H x 90 degrees - 630  
1 Threshold DraftSeal DS501TB x 2000 - AL  
1 Power Supply Schlage PS904 x 900-4R x 900-BBK x 900-KL (2 doors)  
2 Electric Power Transfers EPT10 - SP28  
1 Electric Horn Alarm Schlage 1910-1 - WH  
1 Keyswitch Schlage 653-1414 x L2 x Mort. Cyl. 42 x GMK’d - 630  
2 Door Position Switches GE Interlogix # 1076D DPDT UL - G  
Door seal, astragals, and sweeps supplied by door supplier  
Card Reader & Controller supplied by Access Control Section

Set #H-17 Sliding Partition / Grille Doors 114\*\*, 115; Each to have:

1 Pair Mortise Cylinders Sargent 42 x GMK’d x #106 cam to suit - 32D  
1 Set Push / Pull Ives PR9266F x 36” O/A x B. to B. Mtg. “P” - 630AM\*\*(Dr. 114 Only)  
Balance of hardware by door supplier

Set #H-18 Single Sliding Doors 116, 117, 118; Each to have:

1 Set Sliding Door Hardware KNC C-994-108 x 2000\*mm c/w C-108, C-994, C-100HD, C-914, & C-913. \*Door 116-2400mm  
1 Door Lock KNC C-92L-HL - 626  
1 Mortise Cylinder Sargent 42 x GMK’d x #106 cam to suit - 32D

Set #H-19 Single Door 119; Each to have:

4 Hinges Ives 5BB1HW 5 x 4 ½ - 630  
1 Mortise Lever Lockset Schlage LV9485L-03/A x 283-722 Indicator – 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Automatic Door Operator – Refer to Section 08 71 13  
1 Actuator Switch – Refer to Section 08 71 13  
1 Kickplate Ives 8400B4E 250mm x 950mm - 630  
1 Floor Stop Ives FS439 - 626  
1 Set Door Seal DraftSeal DS44D x 5700mm - BN  
1 Electric Strike HES 1006CS-T Fail Safe x 24 V - 630  
1 Restroom Control Kit Camden CX-WC13FM – to include: CX-33 Advanced Logic Control, CM-45/8/GRFSE1 4 ½" Illuminated Push Plate Switch (PUSH TO LOCK), with sign, CM-45/4/GRFSE1 4 ½" Illuminated Push Plate (Wheelchair symbol and PUSH TO OPEN), with sign, CX-MDC Magnetic Door Contact  
1 Single Gang "Occupied" LED Annunciator Camden CM-AF500 - 630  
NOTE: Wiring, conduit, and hook-up by Section 26 - Electrical

Set #H-20 Pair Doors 120; Each to have:

2 Continuous Hinges Ives 112HD x 90" - Custom CTL x 1/EPT Prep - 628  
1 Conc. V/R Exit Device Von Duprin RX-QEL3547L-360L-03 - 4' dr.(LHR Dr.) - 626AM  
1 Conc. V/R Exit Device Von Duprin 3547EO x 4' dr. (RHR Dr.) - 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Automatic Door Operator – Refer to Section 08 71 13  
2 Actuator Buttons – Refer to Section 08 71 13  
1 Advanced Logic Relay Switching Network Camden CX-33  
1 Keyswitch Schlage 653-1414 x L2 x Mort. Cyl. 42 x GMK'd - 630  
1 Door Closer LCN 4040XP-REG T/J SRI (RHR Dr.) - 689  
1 Mounting Plate LCN 4040XP-18G SRI - 689  
2 Conc. O/H Door Stops/holders Glynn-Johnson 105S x 95 degrees - 630  
1 Threshold DraftSeal DS5000 x 2000 - AL  
1 Power Supply Schlage PS904 x 900-2RS x 900-BBK x 900-KL (2 doors)  
1 Electric Power Transfer EPT10 - SP28  
Door seal and sweeps supplied by door supplier

Set #H-21 Single Doors 122, 123; Each to have:

4 Hinges Ives 5BB1HW 4 ½ x 4 ½ - 652  
1 Mortise Lockset Schlage L9056L - 03/A - 626  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Floor Stop Ives FS439 - 626  
1 Set Door Seal DraftSeal DS55D x 5700 - BN

Set #H-22 Single Door 124; Each to have:

4 Hinges Ives 5BB1HW 4 ½ x 4 ½ - 652  
1 Mortise Lockset Schlage L9070L - 03/A - 626  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Floor Stop Ives FS439 - 626

Set #H-23      Single Door 125; Each to have:

4 Hinges Ives 5BB1HW 4 ½ x 4 ½ - 652  
1 Mortise Lockset Schlage L9070L - 03/A - 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Door Closer LCN 4050 Hw/PA-REG SRI x T/B - 689  
1 Kick Plate Ives 8400B4E-200 x 950 - 630  
1 Floor Stop Ives FS439 - 626  
1 Set Door Seal DraftSeal DS55D x 5700 - BN

Set #H-24      Single Doors 126, 127; Each to have:

3 Hinges Ives 5BB1 4 ½ x 4 - 630  
1 Mortise Privacy Set Schlage L9040 - 03/A x E/K x 10-072 - 626AM  
1 Door Closer LCN 4050 Hw/PA-REG SRI x T/B - 689  
1 Kick Plate Ives 8400B4E-250 x 850 - 630  
1 Floor Stop Ives FS439 - 626  
1 Set Door Seal DraftSeal DS44D x 5200 - BN

Set #H-25      Single Door 128; Each to have:

1 Continuous Hinge Ives 112HD x 94.5" - Custom CTL - 628  
1 Deadlatch A-R 4900-201 x 1 ½" B/S - 628  
1 Deadlatch Handle A-R 4560-01 x 4580 - 130  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Set Push/Pull Combo Ives 9103EZHD-10" x 37" C. to C. x J-N/O mtg. - 630AM  
1 Door Closer LCN 4050T BUMPER SRI x T/B - 689  
1 Mounting Plate LCN 4050-18 SRI- 689  
1 Conc. O/H Door Stop Glynn-Johnson 105S x 95 degrees DS - C32D  
Door seal and sweep supplied by door supplier

Set #H-26      Single Door 129; Each to have:

1 Continuous Hinge Ives 112HD x 90" - Custom CTL - 628  
1 Deadlatch A-R 4900-201 x 1 ½" B/S - 628  
1 Deadlatch Handle A-R 4560-01 x 4580 - 130  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Set Push/Pull Combo Ives 9103EZHD-10" x 37" C. to C. x J-N/O mtg. - 630AM  
1 Automatic Door Operator – Refer to Section 08 71 13  
1 Actuator Switch – Refer to Section 08 71 13  
1 O/H Door Stop Glynn-Johnson 905S x 105 degrees - 630  
1 Electric Strike HES 1006CS-T Fail Safe x 24 V - 630  
1 Restroom Control Kit Camden CX-WC13FM – to include: CX-33 Advanced Logic Control, CM-45/8/GRFSE1 4 ½" Illuminated Push Plate Switch (PUSH TO LOCK), with sign, CM-45/4/GRFSE1 4 ½" Illuminated Push Plate (Wheelchair symbol and PUSH TO OPEN), with sign, CX-MDC Magnetic Door Contact  
1 Single Gang "Occupied" LED Annunciator Camden CM-AF500 - 630  
NOTE: Wiring, conduit, and hook-up by Section 26 - Electrical  
Door seal and sweep supplied by door supplier

Set #H-27 Single Doors 130, 131; Each to have:

4 Hinges Ives 5BB1HW 4 ½ x 4 ½ - 630  
1 Mortise Privacy Set Schlage L9440 - 03/A x Indicator L283-426 x E/K x 10-072 - 626AM  
1 Door Closer LCN 4050 Hw/PA-P/A SRI x T/B - 689  
1 Kick Plate Ives 8400B4E-250 x 950 - 630  
1 Floor Stop Ives FS439 - 626  
1 Set Door Seal DraftSeal DS44D x 5700 - BN

Set #H-28 Single Door 132, ; Each to have:

4 Hinges Ives 5BB1HW 5 x 4 ½ - 630  
1 Mortise Lever Lockset Schlage LV9485L-03/A x 283-722 Indicator – 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Automatic Door Operator – Refer to Section 08 71 13  
1 Actuator Switch – Refer to Section 08 71 13  
1 Kickplate Ives 8400B4E 250mm x 950mm - 630  
1 O/H Door Stop Glynn-Johnson 905S x 95 degrees - 630  
1 Set Door Seal DraftSeal DS44D x 5700mm - BN  
1 Electric Strike HES 1006CS-T Fail Safe x 24 V - 630  
1 Restroom Control Kit Camden CX-WC13FM – to include: CX-33 Advanced Logic Control, CM-45/8/GRFSE1 4 ½" Illuminated Push Plate Switch (PUSH TO LOCK), with sign, CM-45/4/GRFSE1 4 ½" Illuminated Push Plate (Wheelchair symbol and PUSH TO OPEN), with sign, CX-MDC Magnetic Door Contact  
1 Single Gang "Occupied" LED Annunciator Camden CM-AF500 - 630  
NOTE: Wiring, conduit, and hook-up by Section 26 - Electrical

Set #H-29 Single Coiling Doors 133, 134, 135, 136; Each to have:

1 Pair Mortise Cylinders Sargent 42 x GMK'd x #106 cam to suit - 32D

Set #H-30 Pair Doors 137; Each to have:

2 Continuous Hinges Ives 112HD x 90" - Custom CTL - 628  
1 Set Constant Latching Flush Bolts Ives FB51P x LH Dr. - 630  
1 Deadlatch A-R 4900-201 x 1 ½" B/S x RH Dr. - 628  
1 Deadlatch Handle A-R 4560-01 x 4580 - 130  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
1 Set Push/Pull Combo Ives 9103EZHD-10" x 37" C. to C. x J-N/O mtg. - 630AM  
2 Door Closers LCN 4050 Hw/PA-REG SRI x T/B - 689  
2 Mounting Plate LCN 4050-18 SRI- 689  
2 Floor Stops Ives FS439 - 626  
1 Threshold DraftSeal DS500 x 2000 - AL  
Door seal, astragals, and sweeps supplied by door supplier

Set #H-31 Pair Doors 140; Each to have:

2 Continuous Hinges Ives 112HD x 90" - Custom CTL x EPT Prep - 628

1 Conc. V/R Exit Device Von Duprin SS-E-3547L-BE x E360L-BE-FSE - 4' dr.(RHR Dr.) - 626AM  
1 Conc. V/R Exit Device Von Duprin SS-3547EO x 4' dr. x EEO Signs (2) (LHR Dr.) - 626AM  
3 Mortise Cylinders Sargent 42 x GMK'd x #106 cam to suit - 32D  
2 Door Closers LCN 4050 Hw/PA-REG SRI - 689  
2 Mounting Plates LCN 4050-18 SRI- 689  
2 Floor Stops Ives FS439 - 626  
1 Threshold DraftSeal DS5000 x 2000 - AL  
1 Power Supply Schlage PS904 x 900-4R x 900-BBK x 900-KL  
2 Electric Power Transfers EPT10 - SP28  
1 Electric Horn Alarm Schlage 1910-1 - WH  
1 Keyswitch Schlage 653-1414 x L2 x Mort. Cyl. 42 x GMK'd - 630  
2 Door Position Switches GE Interlogix # 1076D DPDT UL - G  
Door seal, astragals, and sweeps supplied by door supplier

Set #H-32 Pair Doors 141; Each to have:

8 Hinges Ives 5BB1HW 5 x 4 ½ - 630  
1 Set Constant Latching Flush Bolts Ives FB51P x LHR Dr. - 630  
1 Mortise Lockset Schlage L9080L - 03/A x RHR Dr. - 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
2 Door Closers LCN 4050 Hw/PA-REG SRI x T/B - 689  
2 Kick Plates Ives 8400B4E-250 x 950 x 8401 TAPE - 630  
2 Floor Stops Ives FS439 - 626  
1 Threshold DraftSeal DS500 x 2000 - AL  
1 Set Door Seal DraftSeal DS44D x 6700 - BN  
2 Door Sweeps DraftSeal DS149C x 1000 - AL  
1 Set Astragals DraftSeal DS163NB x 2350 - AL  
1 Door Coordinator Ives COR7G x Carry Bar CB1 - 626

Set #H-33 Pair Doors 143; Each to have:

8 Hinges Ives 5BB1HW 5 x 4 ½ - 630  
1 Set Constant Latching Flush Bolts Ives FB51P x LHR Dr. - 630  
1 Mortise Lockset Schlage L9080L - 03/A x RHR Dr. - 626AM  
1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D  
2 Door Closers LCN 4050 Hw/PA-P/A SRI x T/B - 689  
2 Kick Plates Ives 8400B4E-250 x 950 x 8401 TAPE - 630  
2 Floor Stops Ives FS439 - 626  
1 Threshold DraftSeal DS500 x 2000 - AL  
1 Set Door Seal DraftSeal DS44D x 6700 - BN  
2 Door Sweeps DraftSeal DS149C x 1000 - AL  
1 Set Astragals DraftSeal DS163NB x 2350 - AL  
1 Door Coordinator Ives COR7G x Carry Bar CB1 - 626

Set #H-34 Single Doors 139, 144, ; Each to have:

4 Hinges Ives 5BB1HW 4 ½ x 4 ½ - 630  
1 Mortise Lockset Schlage L9080L - 03/A - 626AM

- 1 Mortise Cylinder Sargent 42 x GMK'd x #106 cam to suit - 32D
- 1 Door Closer LCN 4050 Hw/PA-REG x T/B - 689
- 1 Kick Plate Ives 8400B4E-250 x 950 - 630
- 1 Floor Stop Ives FS439 - 626
- 1 Set Door Seal DraftSeal DS44D x 5700 - BN
- 1 Door Sweep DraftSeal DS138C x 1000 - AL

**END OF SECTION 08 71 00**

Automatic Door Operators

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Automatic door operators.

### **1.2 Administrative Requirements**

- .1 Coordination:
  - .1 Check dimensions at the *Place of the Work* before fabrication commences, and report to *Consultant* in writing all discrepancies.
  - .2 Where dimensions are not available before fabrication commences, the dimension required shall be agreed upon between the various sections concerned.

### **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 Shop drawings to be prepared specifically for this *Contract* and to indicate location of components, anchorage details, adjacent construction interface, and dimensions as well as all necessary wiring and electrical requirements.
- .4 Samples:
  - .1 Submit samples of each finish material proposed for use in the *Work*.
- .5 Certificates:
  - .1 Submit certificate of conformance to specified standards following procedures for submittal of *Product* data.
- .6 Templates:
  - .1 Submit templates to *Contractor* for use by installers and fabricators as required for proper location and installation of hardware.

### **1.4 Closeout Submittals**

- .1 Operation and maintenance data:
  - .1 Demonstrate, and provide instruction in, the proper operation and maintenance of the *Products Provided* as part of the work of this section to the *Owner* in accordance with Section 01 77 00.
  - .2 Submit operation data and maintenance data for cleaning and maintenance of hardware for incorporation into the operation and maintenance manual specified in Section 01 77 00.

## Automatic Door Operators

---

### 1.5 Quality Assurance

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 Execute the work of this section only by a certified *Subcontractor* 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.
    - .2 Installer shall be approved in writing by the manufacturer of the operators for installation of their *Product*.
  - .2 Barrier free door operators shall be certified by the manufacturer to performance design criteria in accordance with CAN/CSA C22.2 No. 247-92(R2014), and ANSI/BHMA A156.19-2013.

### 1.6 Delivery, Storage, and Handling

- .1 Store finishing hardware in locked, clean dry area.
- .2 Package each item of hardware, including fastenings, separately or in like groups of hardware, and label each package as to item definition and location.
- .3 Submit hardware 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 Use ULC or ULI listed and labelled hardware in fire separations and exit doors.
- .2 Be responsible for, and abide by, all requirements and regulations of the building code. Conduct tests and inspections required, and pay all charges incidental thereto.

### 2.2 Automatic Door Operators – General

- .1 Basis of design:
  - .1 Camden Door Controls 'CM-75 Column Switch'.
- .2 Operation:
  - .1 Activation type:
    - .1 Column.
  - .2 Door to safely stop and reverse if an object is encountered in the opening or closing cycle.
  - .3 Operating forces:
    - .1 Continuous bar: 22.2 N.
  - .4 Factory-set door hold open voltage.
  - .5 Fail safe: In the event of power failure, door shall operate manually, without damage to operator components.

## Automatic Door Operators

---

### .3 Bollard:

#### .1 Basis of design:

- .1 Camden Door Controls 'CM-42-DSU-CLR', 1069 mm (42") extruded aluminum bollard.

## 2.3 Finishes

- .1 Clear anodized.

## 2.4 Fabrication

- .1 Fit intersecting members to flush hairline weathertight joints and mechanically fasten together, except where indicated otherwise.
- .2 Conceal fastenings from view, except where indicated otherwise.
- .3 Form cut-outs, recesses, mortising or milling for finishing hardware to templates supplied. Reinforce with aluminum or galvanized steel plates.
- .4 Field apply isolation coating to aluminum in contact with dissimilar metals or cementitious materials.

## PART 3 - EXECUTION

### 3.1 Examination

- .1 Verify that door openings are properly installed and ready to receive the work of this section.
- .2 Verify that electrical service is available, properly located, and of proper type.
- .3 Check dimensions at the *Place of the Work* before fabrication commences, and report to *Consultant* in writing all discrepancies.
- .4 Where dimensions are not available before fabrication commences, the dimension required shall be agreed upon between the various sections concerned.

### 3.2 Preparation

- .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.
- .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.

### 3.3 Installation

- .1 Install in accordance with manufacturer's instructions and in accordance with CAN/CSA C22.2 No. 247-92(R2014).

Automatic Door Operators

---

- .2 *Provide* operator system complete in all its parts and connected to electrical service *Provided* as part of the work of Divisions 26, 27, and 28. Secure all wiring such that it is concealed from view.

**3.4 Adjusting and Cleaning**

- .1 Verify that installed hardware and operators function properly, and instruct installers accordingly of requirements and procedures for adjustments for operation without binding or scraping, and without excessive noise.
- .2 Clean hardware after installation in accordance with *Supplier's* instructions.

**END OF SECTION**

Glass and Glazing

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Glass and glazing.

### **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 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 For glass scheduled or indicated as engineered and glass to serve as guards in accordance with building code, shop drawings to be engineered shop drawings. Refer also to Section 08 88 00 for requirements of glass guards.
  - .3 Indicate analysis of glass including maximum deflection and allowable stresses from imposed dead/live loads and thermal loads.
- .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 3 control samples for each glass type showing maximum range of visible difference between units for the *Project*.
    - .2 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.

## Glass and Glazing

---

- .7 Submit sample glazing warranty.
- .8 Submit letter from IGMAC or IGMA/IGCC, or a test report prepared by independent testing company confirming insulating glass units of the types required have been successfully tested in accordance with CAN/CGSB 12.8-97 or ASTM E2190-10 and will withstand design loads specified in 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 maintenance and cleaning instructions for glass and glazing for incorporation into the operating and maintenance manuals.

### 1.5 Quality Assurance

- .1 Qualifications:
  - .1 Manufacturers: Fabrication processes, including low emissivity and reflective coatings, insulating, laminated, silk-screening 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: *Provide* the work of this section executed by specialist *Subcontractor* who shall be thoroughly trained and experienced in skills required, be completely familiar with referenced standards and requirements of the work of this section, and personally direct installation performed under this section.
    - .1 Foreperson experience: Minimum 10 years experience as glazing mechanic.
    - .2 Glazing mechanic experience: Minimum 3 years experience as glazers.
    - .3 Mirror installations: Installation only by applicator trained and approved by adhesive manufacturer for application of its products.
  - .3 Aspects of the work of this section are required to be prepared by a professional engineer. Refer to Section 01 33 00 for specific details and requirements in this regard.
- .2 Mock-ups:
  - .1 Provide mock-up of mirror installation, including minimum of 4 full size mirrors. Locate mirror mock-up where approved by *Consultant*.

### 1.6 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 instructions 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

---

### 1.7 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.

### 1.8 Extended Warranty

- .1 The glazing systems shall perform properly to the extent that the design and *Contract Documents* permit such performance for the duration of the warranty period.
- .2 Special product warranty for coated-glass products:
  - .1 Provide written 10 year warranty from date of manufacture for coated glass. Warranty shall cover deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions. Warranty shall be manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units.
- .3 Special product warranty for laminated glass products:
  - .1 Provide written 5 year warranty from date of manufacture for laminated glass. Warranty shall cover deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions. Warranty shall be manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units.
- .4 Special product warranty for tempered glass products:
  - .1 Provide a written 5 year warranty from date of manufacture for fully tempered glass. Warrant that tempered glass will not break spontaneously as a result of Nickel Sulfide (NiS) inclusions at a rate exceeding 0.8% (8/1000) for a period of five years from the date of manufacture. Warranty shall be manufacturer's standard form in which tempered-glass manufacturer agrees to replace tempered-glass units.
- .5 Special product warranty for insulating glass unit products:
  - .1 Provide a written warranty from date of manufacture for sealed insulating glass units. Warranty shall cover the following:
    - .1 Deterioration due to normal conditions of use and not to handling, installing, protecting and maintaining practices contrary to the glass manufacturer's published instructions.
    - .2 Replacement of sealed insulating glass units.
    - .3 No dollar limit.
    - .4 Non-prorated.
    - .5 10-year warranty duration.
- .6 Special product warranty for mirror glass products:

## Glass and Glazing

---

- .1 Provide a written warranty from date of manufacture for mirror silvering. Warranty shall cover the following:
  - .1 Deterioration due to normal conditions of use and not to handling, installing, protecting and maintaining practices contrary to the glass manufacturer's published instructions.
  - .2 Replacement of mirror glass units.
  - .3 10 year warranty duration.

## 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 Glass strength:
  - .1 Provide glass products in the thickness and strengths required to meet or exceed the following criteria based on project loads and in-service conditions.
    - .1 Analysis shall comply with CAN/CGSB 12.20-M89.
    - .2 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 1 break per 1000 for glass guards and railings.
      - .3 1 break per 1000 for glass installed 15 degrees or more from the vertical plane and under action of wind and/or snow.
    - .3 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 Glass at guards, balustrades, and where glass is likely to be subjected to human impact shall comply with safety glass requirements of CAN/CGSB 12.20-M89 and CAN/CGSB 12.1-M90, DIN EN 14179-1 September 2005 where applicable, and building code.
  - .3 *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

---

- .4 Glass thicknesses and glass types specified, indicated, or scheduled in the *Contract Documents* are minimums required. Glass designer/engineer to modify 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.
- .3 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 LBNL WINDOW 5.2 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.
- .4 Glazing systems shall be capable of withstanding normal thermal movements, without failure, including loss due to defective manufacture, fabrication and installation; deterioration of glazing materials; and other defects in construction.
- .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 instructions.

## 2.2 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, minimum 12 mm (1/2") air spaces, 90% argon/10% air filled, double sealed edges (primary to be polyisobutylene, secondary to be polysulphide), desiccant filled warm edge spacer (splice connectors at corner of each glass unit).
    - .1 Warm edge spacer:
      - .1 Acceptable *Products*:
        - .1 Fenzi 'Chromatech'.
        - .2 Prelco 'R-MAX'.
        - .3 Substitutions: in accordance with Section 01 25 00.
  - .2 IGMAC or IGMA/IGCC certified.

Glass and Glazing

---

- .3 Low 'E' coating (double silver):
  - .1 Acceptable *Products*:
    - .1 Cardinal 'LoE<sup>2</sup> 272'.
    - .2 Pilkington 'Suncool 70/40'.
    - .3 Vitro Architectural Glass 'Solarban 60'.
  - .4 Glass thickness: 6 mm (1/4") minimum, and as required to suit design requirements or as otherwise indicated.
  - .5 Glass colour: clear, unless otherwise indicated.
- .3 Annealed (float) glass:
  - .1 Clear, annealed glass, 6 mm (1/4") thick minimum, CAN/CGSB 12.3-M91, Glazing Quality.
- .4 Heat treated (tempered or heat strengthened) float glass:
  - .1 CAN/CGSB 12.1-M90.
  - .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 C1048-12e1.
  - .5 For coated vision glass, comply with requirements for Condition C (other coated glass) in accordance with ASTM C1048-12e1.
  - .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 4 mm (3/16") 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.
    - .2 Sloped (greater than 15 degrees from vertical): not less than 1.52 mm (0.060") 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.

Glass and Glazing

---

- .7 Laminated glass products to be fabricated free of foreign substances and air or glass pockets in autoclave with heat plus pressure.
- .6 Uncoated tinted glass:
  - .1 To CAN/CGSB 12.4-M91, 6 mm (1/4") minimum thickness, heat strengthened,
  - .2 Colour: Grey.
  - .3 Acceptable *Products*:
    - .1 Pilkington 'SuperGrey'.
    - .2 Vitro Architectural Glass 'Graylite II Tinted Glass'.
    - .3 Substitutions: in accordance with Section 01 25 00.
- .7 Mirrors:
  - .1 Annealed glass, to ASTM C1503-08(2013) as follows:
  - .2 Grade: Mirror Cut Size.
  - .3 Quality: Mirror Select Quality, except allowable distortion shall be  $\geq 80^\circ$  vision interference angle to ASTM C1036-16 Table 5.
  - .4 Colour: Clear.
  - .5 Thickness: 6 mm (1/4")
  - .6 Exposed edges shall be chamfered, ground, and polished.
  - .7 For indicated mirrors, shop-apply impact-resistant film adhered to entire back surface of mirrors.
    - .1 White polyester scrim-reinforced film, 100 microns (4 mils) thick, with pressure-sensitive acrylic adhesive, specifically designed as safety backing for mirrors. Application of film to mirrors shall provide compliance with CPSC 16 CFR 1201 for Category II materials.
    - .2 Provide in widths as required for a single sheet of film to cover full extent of each mirror.
    - .3 Provide with additional adhesives as recommended by film manufacturer.
    - .4 Basis of design:
      - .1 C.R. Laurence Company, Inc. 'Category II Shatterproof Safety Tape for Mirrors, No. 2MT'.
- .8 Back painted glass (GL-BP1):
  - .1 Tempered, low-iron glass meeting requirements of ASTM C1048-12e1, kind HS, kind FT coated and uncoated, 6 mm (1/4") thick, minimum, coating on No. 2 surface, 'MagiCoat Water Based Coating', by Imagic Glass.
    - .1 Colours; locations as indicated or scheduled:
      - .1 #933.
      - .2 #934.
  - .2 Low iron glass acceptable *Products*:

## Glass and Glazing

---

- .1 AGC 'Krystal Klear'.
- .2 Guardian 'Ultraclear'.
- .3 Pilkington 'Opti-White'.
- .4 PPG 'Starphire'.
- .5 Saint-Gobain 'Diamente'.
- .3 Acceptable manufacturers:
  - .1 Central Canadian Glass.
  - .2 CLO Glass.
  - .3 Camden Glass.

### 2.3 Glazing Materials

- .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 C1115-06(2011).
- .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 C1115-06(2011).
- .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 C1115-06(2011).
- .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 C1115-06(2011).
- .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.
- .8 Silicone glazing (Weatherseal) sealant:
  - .1 Medium-modulus, neutral-curing silicone sealant; complying with ASTM C920-11, Type M or S, Grade NS, Class 25.
  - .2 Acceptable *Products*:
    - .1 Dow Corning '790'.

### Glass and Glazing

---

- .2 Dow Corning '795'.
- .3 Pecora '864' or '890'.
- .4 Sika 'Sikasil WS-290'.
- .5 Sika 'Sikasil WS-295'.
- .6 Tremco 'Spectrum 1'.
- .7 Tremco 'Spectrum 2'.
- .8 Momentive 'SilGlaze II'.
- .1 Mirror perimeter edge framing:
  - .1 Washrooms: CRL Aluminum 1/4" or 3/8" L - Bar Extrusion, satin anodized finish.
  - .2 Change Rooms and wet areas: CRL Standard Heavy Indented Back Aluminum 1/4" J - Channel, satin anodized finish.
  - .3 Mirrors; plywood backup substrate: 25 mm x 25 mm x 3 mm angle extrusion, satin anodized finish.
- .2 Plywood backup; where indicated: 16 mm thick, exterior grade bonded Douglas Fir plywood with Grade A face veneer for face to receive mirrors and Grade C face veneer for side facing wall, to CSA O121-M1978.
- .3 Mirror adhesive: Palmer Mirro-Mastic, complete with sealer as required.
- .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: as selected by *Consultant* from full colour range.
  - .3 Acceptable *Products*:
    - .1 Dow Corning '999-A'.
    - .2 Momentive 'SCS1200'.
    - .3 Pecora '860'.
    - .4 Tremco 'Proglaze'.

## 2.4 Fabrication

- .1 Factory sealed insulating glass units:
  - .1 Fabricate units to requirements of CAN/CGSB 12.8-97.
  - .2 Spacer core shall be straight and evenly set into glass units.
  - .3 Insulating glass units shall be manufactured to conform to IGMAC recommendations (Insulated Glass Manufacturers Association of Canada) and the manufacturer shall be a member of IGMAC. Sealed units shall bear IGMAC certification markings.
- .2 Grind, chamfer, and polish exposed glass edges, 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:
  - .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 IGMA 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 instructions. Ensure surfaces are free of moisture and frost.

### **3.3 Glazing - General**

- .1 Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- .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.

## Glass and Glazing

---

- .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").
  - .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.

### 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 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  $\frac{1}{4}$  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  $0.0929 \text{ m}^2$  (1  $\text{ft}^2$ ) 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).
  - .5 Press mirror firmly in place making good contact between the mirror, mastic, and substrate.

Glass and Glazing

---

- .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 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 Finishing**

- .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.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Translucent film; applied to interior glazing.

### **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 - 200 mm x 200 mm (8" x 8") samples of each specified film type, pattern and colour.

### **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 incorporation into operating and maintenance manuals.
  - .2 Instruct *Owner's* representative on proper care and maintenance for work of this section.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators: Execute the work of this section only by a *Subcontractor* with minimum 5 years experience in application of *Products* specified.

### **1.5 Delivery, Storage, and Handling**

- .1 Package materials and identify on attached labels the manufacturer, contents and material specification number.

### **1.6 Field Conditions**

- .1 Conform to manufacturer's written documented temperatures, relative humidity, and substrate moisture content and temperature for application of materials of this section.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Applied films; translucent:
  - .1 Basis of design:

- .1 3M 'Scotchcal 7725SE Special Effects', 314 Dusted Crystal.

### **PART 3 - EXECUTION**

#### **3.1 Examination**

- .1 Examine glass surfaces to receive film and verify that they are free from defects and imperfections which will affect the final appearance of installed film. Correct such deficiencies before starting film application.

#### **3.2 Preparation**

- .1 Prepare surfaces for film application in accordance with film manufacturer's written requirements.
- .2 Window and window framing will be cleaned thoroughly with a neutral cleaning solution. Surface of glass shall be bladed with industrial razor to ensure the removal of any foreign contaminants in accordance with film manufacturer's instructions.
- .3 Towelling or other absorbent material shall be placed on the window sill or sash to absorb moisture accumulation generated by the film application.

#### **3.3 Installation**

- .1 Applied film; interior application:
- .1 Apply film to indicated face of glazing units in accordance with film manufacturer's written requirements, applied plumb, true and level over clean glazing, without air bubbles, wrinkles, blisters, and other defects.
- .2 After installation, applied film shall be flat with no obvious concentrations of moisture, free of creases, free of tears, with no moisture dimples when viewed under normal conditions.
- .3 Film edges shall be cut neatly and square at a uniform distance of 1.5 mm (1/16") to 0.79 mm (1/32") from frame.

#### **3.4 Adjusting and Cleaning**

- .1 Clean film and glass surfaces so they are free of foreign matter using cleaners recommended by film manufacturer.

#### **3.5 Protection**

- .1 Comply with manufacturer's written requirements respecting protection.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Louvres.

### **1.2 Administrative Requirements**

### **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, including the following information:
    - .1 Air flow and water entrainment performance test results.
    - .2 Material types and thickness.
- .3 Shop drawings:
  - .1 Submit engineered shop drawings.
  - .2 Include elevations, sections and specific details for each louvre.
  - .3 Show anchorage details and connections for component parts.
- .4 Samples:
  - .1 Submit colour chips for approval. Submit duplicate samples of each type of louvre showing colour and finish.
- .5 Test and evaluation reports:
  - .1 Air and water performance data: Submit AMCA test data as required to confirm that the louvres have the specified air and water performance characteristics when tested in accordance with AMCA 500-L-12.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors: *Provide* work of this section, executed by competent installers with experience in application of *Products*, systems and assemblies specified, and with approval of *Product* manufacturer.
  - .2 Aspects of the work of this section are required to be prepared by a professional engineer. Refer to Section 01 33 00 for specific details and requirements in this regard.

## **PART 2- PRODUCTS**

### **2.1 Manufacturer**

- .1 Specifications are based on *Products* of the Construction Specialties. The following listed manufacturers are acceptable only when in compliance with requirements of this section.

Louvres

---

- .1 Airlite Company.
- .2 Construction Specialties.
- .3 Price Industries Ltd.
- .4 McGill Architectural Products.
- .5 Ten Plus Architectural Products Ltd.
- .6 Ventex Inc.
- .7 Substitutions: in accordance with Section 01 25 00.

## 2.2 Performance/Design Requirements

- .1 Structural requirements: Design louvres to withstand, wind and snow loads as required by the building code, to maximum allowable deflection without permanent deformation. Maximum allowable deflection for the louvre structural members to be L/180 or 19 mm (3/4"), whichever is less. Maximum allowable deflection for the louvre blades to be L/120 or 13 mm (1/2") across the weak axis, whichever is less.
- .2 Aluminum framing members shall be designed in accordance with CAN/CSA-S157-05/S157.1-05.
- .3 Design structural steel structural components and fasteners in accordance with CSA-S16-09.
- .4 Delegated design: Design louvres, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.
- .5 Structural performance: Louvres shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louvre components, noise or metal fatigue caused by louvre blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
- .6 Thermal movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
- .7 Louvre performance ratings: Provide louvres which have been tested (manufacturer's stock units identical to those provided, except for length and width) according to AMCA 500-L-12

## 2.3 Wall Louvres

- .1 General:
  - .1 Single source responsibility: *Provide* complete system from one manufacturer.
- .1 Louvre:
  - .1 Acceptable *Product*: Model A4100 Non-Drainable Louvres, 101.6 mm (4") depth as manufactured by C/S Construction Specialties Company.
  - .2 Description:

Louvres

---

- .1 Heads, sills, jambs and mullions to be one piece structural aluminum members with integral caulking slot and retaining beads.
- .2 Mullions shall be sliding interlock.
- .3 Blades to be one piece aluminum extrusions with reinforcing bosses.
- .4 Material thickness to be as follows:
  - .1 Heads, sills, jambs and mullions: 2.06 mm (0.081").
  - .2 Blades: 1.72 mm (0.068").
- .5 Louvres to be supplied with 50 mm (2") high by full depth sill flashings formed from minimum 1.27 mm (0.050") thick aluminum, complete with sealed end dams to direct water to exterior.
- .6 Louvres and sill flashings to be installed provide complete water integrity performance of the louvre system, and drain water infiltration from interior face of louvre/blank-off assembly to exterior.
- .3 Performance:
  - .1 AMCA performance: 1.2 m x 1.2 m (4' x 4') unit shall conform to the following
    - .1 Free Area: 7.36 sq. ft. (0.68 sq. m.).
    - .2 Free area velocity at the point of beginning water penetration: 659 FPM (201.0 m/min).
    - .3 Intake pressure drop at the point of beginning water penetration: 2.29 mm (0.09") H<sub>2</sub>O.
    - .4 Exhaust pressure drop at 1000 FPM free area velocity (305 m/min): 4.54 mm (0.179") H<sub>2</sub>O.
- .4 Accessories:
  - .1 Bird screen.

## 2.4 Accessories

- .1 Bird screen and frames:
  - .1 Bird screen mesh: 15.9 mm (5/8") mesh, 1.27 mm (0.050") thick expanded and flattened aluminum screen secured within 1.40 mm (0.055") thick extruded aluminum frames with mitred corners and corner locks.
  - .2 Finish: Mill finish.
- .2 Aluminum extrusions: ASTM B211-12, Alloy 6063-T5, 6063-T6 or 6061-T6.
- .3 Aluminum sheet: ASTM B209-14, Alloy 1100, 3003 or 5005. For anodized finish if required use Alloy 5005.
- .4 Fasteners and anchors: Stainless steel Type 304.
- .5 Arrange blades and frame extrusions as indicated.
- .6 Attach bird screen to non-exposed face of louvres.
- .7 Isolate from other dissimilar metals and materials to prevent electrolysis.

Louvres

---

- .8 Sealant: in accordance with Section 07 92 00.

## **2.5 Finishes**

- .1 Exposed aluminum surfaces: 70% Kynar 500 or Hylar 5000 fluoropolymer resin systems, ceramic pigments and other select inorganic pigments to AAMA 2605-13.
  - .1 Colour to match metal cladding.
- .2 Finish exposed metal fasteners, if applicable, to related aluminum surfaces.
- .3 Finish steel clips and reinforcing steel with 380 g/m<sup>2</sup> (13 oz/ft<sup>2</sup>) zinc coating to CAN/CSA G164-M92.

## **2.6 Fabrication**

- .1 Fabricate finish work free from distortion and effects detrimental to appearance and performance.
- .2 Fasten aluminum louvre framing, blade with stainless steel screws or heliarc welding.
- .3 Louvres indicated to wrap continuously around corners shall be mitred at corner intersection.
- .4 Blank off panels to be full extent of louvres except where penetrated by mechanical services, unless indicated otherwise.

## **PART 3 - EXECUTION**

### **3.1 Installation**

- .1 Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure. Fasten louvres with angle, lag bolts and anchors where required for support with rust proof screws and anchor bolts.
- .2 Apply sealant to joints and penetrations to maintain weather tight installation, while allowing drainage to exterior at sill flashing.
- .3 Anchor louvres to the building substructure.
- .4 Allow for thermal expansion and contraction.
- .5 Repair or replace damaged finishes or materials.
- .6 Erection tolerances:
  - .1 Maximum variation from plane or location shown on the reviewed shop drawings: 3 mm per 3660 mm (1/8" per 12 feet) of length, but not exceeding 13 mm (1/2") in any total building length or portion thereof (non-cumulative).
  - .2 Maximum offset from true alignment between two members abutting end to end, edge-to-edge in line or separated by less than 75 mm (3"): 1.5 mm (1/16") (shop or field joints). This limiting condition shall prevail under both load and no load conditions.

Louvres

---

- .7 Cut and trim component parts during erection only with the approval of the manufacturer, and in accordance with its recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.
- .8 Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
- .9 Set units level, plumb and true to line, with uniform joints.

**END OF SECTION**

## **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 Engineered shop drawings:
  - .1 Provide engineered shop drawings for ceilings and bulkheads in pool and change room areas.
- .4 Shop drawings; for shaftwalls:
  - .1 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.
- .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 *Provide* work of this section, executed by a *Subcontractor* with experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

## **PART 2 - PRODUCTS**

### **2.1 Performance/Design Requirements - Fire Resistance Rated Assemblies**

- .1 Fire resistance rating: 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 Materials for fire resistance rated construction shall conform to requirements of indicated fire resistance rated assembly.

---

Metal Supports for Gypsum and Cement Board

---

## **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<sup>2</sup> (10 lb/ft<sup>2</sup>), 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.

## **2.3 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-11.
  - .2 Heavy duty corrosion protection: Z275 (G90) ASTM A653/A653M-11.

## **2.4 Partition Support Materials**

- .1 Interior non-loadbearing channel stud framing: to ASTM C645-14e1; roll formed from 0.458 mm (25 gauge) minimum thickness unless otherwise indicated or as recommended by gypsum board manufacturer, electro-galvanized steel sheet. Provide service holes starting at 450 mm (18") from bottom, then 914 mm (36") on centre to top of studs.
  - .1 Standard gauge: 0.458 mm (25 gauge) Z120 galvanized studs.
  - .2 Heavy gauge: 0.836 mm (20 gauge) Z275 galvanized studs for secure fastening of higher density panel facings (impact resistant boards, tile backer boards, cement board, plywood)
- .2 Interior floor and ceiling tracks (runners): to ASTM C645-14e1; 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.
- .3 Runner fasteners:
  - .1 To concrete and masonry: Use stub nails.
  - .2 To suspended ceilings: Use prefinished clips to match ceiling grid, as manufactured by CGC.
- .4 Bracing channels: Minimum 19 mm x 10 mm x 1.087 mm (3/4" x 3/8" x 0.0428") cold rolled galvanized steel.

## **2.5 Ceiling Support Materials and Systems**

- .1 General: Size ceiling support components to comply with ASTM C754-15 unless otherwise indicated.

Metal Supports for Gypsum and Cement Board

---

- .2 Main runners: Steel channels, hot or cold rolled; Z180 (G60) galvanized where used in shower rooms and other wet areas.
- .3 Hanger Wire:
  - .1 Standard locations.
  - .2 ASTM A641/A641M-09A(2014), soft, Class 1 galvanized, minimum 3.76 mm (0.148", 9 AWG).
- .4 Heavy Duty Hanger Wire:
  - .1 Locations:
    - .1 Pool areas.
    - .2 Ceramic tile ceilings.
    - .3 Wood ceilings.
  - .2 ASTM A641/A641M-09A(2014), soft, Class 1 galvanized, minimum 4.11 mm (0.162", 8 AWG).
  - .3 A641/A641M-09A(2014), Pencil rod, Class 1 galvanized, 4.76 mm (3/16").
- .5 Hanger wire: ASTM A641/A641M-09A(2014), soft, Class 1 galvanized, minimum 4.064 mm (0.160", 8 AWG).
- .6 Hanger rods and flats: Mild steel with zinc coating, galvanized for exterior applications, interior pool areas, and areas with wood or ceramic tile ceilings.
  - .1 General: Size devices for 5 times load imposed by completed system as determined in accordance with ASTM E488/E488M-15.
    - .1 Power actuated fastening systems are not permitted.
  - .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 C754-15 for maximum ceiling area and loads to be supported.
  - .4 Interior concrete ceiling anchors; acceptable products:
    - .1 Dynabolt Sleeve Anchor 'TW-1614' or 'Redi-Drive Tie Drive' or 'Redi-Drive' by ITW Ramset/Red Head.
    - .2 Redi-Drive by ITW Ramset/Red Head, complete with galvanized angle clip.
    - .3 Trubolt, or Dynabolt anchors by ITW Ramset/Red Head, complete with galvanized angle clip.
    - .4 Kwik-Bolt 3 - HHDCA 1/4 Ceiling Hangers by Hilti.
  - .5 Fasteners exposed to weather, condensation, and corrosion: Zinc-plated or stainless steel fasteners in applicable product lines specified in preceding paragraphs.
  - .6 Fasteners exposed or concealed in ceiling assemblies in swimming pool areas; basis of design:

---

Metal Supports for Gypsum and Cement Board

---

- .1 Ceiling anchor substrate; wood: ITW Buildex "Climaseal" coated steel, in applicable product lines specified in preceding paragraphs.
- .2 Ceiling anchor substrate; concrete: ITW Redhead zinc plated steel with minimum 1.22 mm (0.048") Z275 galvanized clip angles.
- .7 Tie wire: 1.19 mm (0.047", 18 AWG) minimum zinc coated, soft-annealed wire, to ASTM A641/A641M-09A(2014).
- .8 Steel brackets for use in pool areas in lieu of tie wire:
  - .1 38 mm x 38 mm x 89 mm (1-1/2" x 1-1/2" x 3-1/2") 18 gauge steel angles, G90 galvanized.
- .9 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 C754-15.
- .10 Runner (carry) channels: 1.367 mm (0.0538") thick cold rolled steel, primer painted or zinc coated for interior locations, Z275 galvanized for exterior locations, interior swimming pool areas, and areas with ceramic tile ceilings, to ASTM C754-15, 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.
  - .2 38 mm x 19 mm (1-1/2" x 3/4") where supported at centres of 1220 mm (48") maximum.

## **2.6 Furring**

- .1 Furring channels: 0.455 mm (0.018") (25 gauge) minimum typical thickness, minimum 1.092 mm (0.043") (18 gauge) at exterior soffits, pool areas and areas with wood or ceramic tile ceilings, 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. Galvanized finish for exterior areas, pool areas, and interior areas with wood or ceramic tile ceilings
- .2 Resilient furring channels, basis of design: 'Resilient Channel' as manufactured by Nicholson Rollforming or Bailey Metal.
- .3 Z-furring members: Galvanized steel z-shaped furring members; ASTM A653/A653M-11, 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 with factor of safety of 3x per fastener manufacturer data sheets.

## **2.7 Shaftwall**

- .1 Shaftwall studs and accessories: 0.455 mm (0.0179"), 0.836 mm (0.0329") where plywood attachment is required, rolled galvanized steel sheet fabricated specially for gypsum coreboard and facing boards.

---

Metal Supports for Gypsum and Cement Board

---

- .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, Grade A or B, for structural performance of base metal, as well as with ASTM A653/A653M, G60, for hot dip galvanized products, and ASTM A463 for aluminized *Products*.
- .3 Firestop tracks; for shaftwall:
  - .1 Top runner manufactured to allow shaftwall heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated, with factory applied cured intumescent firestop tape adhered to face of one track leg; in metal thickness not less than indicated for studs and in width to accommodate depth of studs.

## **2.8 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.

## **PART 3 - EXECUTION**

### **3.1 Installation General**

- .1 Comply with ASTM C754-15 and manufacturer's instructions, 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.

---

Metal Supports for Gypsum and Cement Board

---

- .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. Such items include, but are not restricted to:
  - .1 Handrail anchors.
  - .2 Coat hooks.
  - .3 Washroom accessories.
  - .4 Mop brackets/shelving.
  - .5 Guards.
  - .6 Cabinetry.
  - .7 Shelving.
  - .8 Window shades.
  - .9 Light fixtures.
  - .10 Toilet, change room, and shower partitions.
  - .11 Accessories at change room stall partitions.
  - .12 Sliding door.
  - .13 Sports Equipment.
  - .14 Projection screen.
  - .15 Wall mounted monitors.
  - .16 Items as indicated.

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/Soffits

- .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. In pool areas and other areas where indicated, mechanically fasten furring channels to each support using steel angle brackets.
- .9 Level cross furring channels to maximum tolerance of 3 mm in 3 m (1/8" in 10 ft).
- .10 Soffit assemblies at exterior conditions:
  - .1 Install framing to carry superimposed and wind loads as per materials manufacturers and building code. Maximum permissible deflection:
    - .1 L/360.
    - .2 L/720 for acrylic stucco directly applied to sheathing board.
  - .2 Wind load bracing:
    - .1 As a minimum, use galvanized single runner channels for clearances up to 1 m (39") and double runner channels mechanically fastened together to form box section for heights greater than 1 m (39").

---

Metal Supports for Gypsum and Cement Board

---

- .2 As a minimum, secure at hanger rod/wire locations with corrosion resistant metal screws at right angles between building structure and soffit framing assembly.
- .11 Install prefinished galvanized drips continuously along edges of exterior gypsum board soffits, colour to match soffit finish.
- .12 Install ceiling framing assemblies at interface with suspended acoustical ceilings specified in Section 09 51 23, to project minimum of 100 mm (4") above acoustic tile suspension assemblies.

### 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.

### 3.6 Resilient Furring

- .1 Erect gypsum board resilient furring maximum 610 mm (24") on centre and not more than 150 mm (6") from ceiling/wall juncture. Secure to each support with 25 mm (1") gypsum wallboard screw.
- .2 Install 150 mm (6") continuous strip of 12.7 mm (1/2") gypsum board along base of partitions where resilient furring installed.
- .3 *Provide* resilient furring channel transverse to framing members, or as indicated.
- .4 On partitions, install resilient furring with outer leg oriented upward.

### 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.

Metal Supports for Gypsum and Cement Board

---

- .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.
- .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/m<sup>2</sup> (5 lb/ft<sup>2</sup>) 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 *Provide* metal studding to maximum tolerance of 3 mm in 3 m (1/8" in 10 ft).
- .11 Coordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .12 Coordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other sections.
- .13 Unless otherwise indicated, partitions, together with gypsum board facings, shall extend above ceilings to underside of structure above.
- .14 Maintain clearance to avoid transference of structural loads to studs.
- .15 Chase walls:
  - .1 *Provide* chase walls where indicated, 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. Coordinate construction of partitions to suit installation of services.
- .16 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.

Metal Supports for Gypsum and Cement Board

---

**3.8 Control Joints**

- .1 Control joints: in accordance with Section 09 29 00.

**3.9 Concrete Anchors**

- .1 *Provide* anchorage points in reinforced concrete floor slab underside in accordance with gypsum board manufacturer's suspension requirements. 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.

**END OF SECTION**

Gypsum and Cement Board

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section Includes
  - .1 Gypsum board; plain for dry locations, GWB-STD.
  - .2 Gypsum board; fire-rated.
  - .3 Core board for shaftwall assemblies, GWB-S.
  - .4 Abuse resistant gypsum board, GWB-AR.
  - .5 Impact resistant gypsum board, GWB-IR.
  - .6 Tile backer board; gypsum board, GWB-TB.
  - .7 Tile backer board; cement board, CBD-TB.
  - .8 Exterior sheathing board; glass scrim gypsum sheathing board.
  - .9 Air barrier sheathing board.
  - .10 Cement board; exterior grade.
  - .11 Gypsum board accessories and miscellaneous related materials.
  - .12 Access doors.
  - .13 Insulation types as follows:
    - .1 INS-60: Mineral fibre sound attenuation batts.

### **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:
  - .1 Submit fire-rated assembly listings for each required fire resistance rated assembly for work of this section.

### **1.3 Quality Assurance**

- .1 *Subcontractor* executing the work of this section shall have a minimum of 5 years continuous experience in successful installation of work of type and quality indicated and specified.

### **1.4 Delivery, Storage, and Handling**

- .1 Store materials in protected dry areas. Store gypsum board flat in piles with edges protected.
- .2 Ensure that finish metal members are not bent, dented, or otherwise deformed.

## Gypsum and Cement Board

---

- .3 Deliver *Products* supplied under the work of this section only to those who are responsible for installation, to the place they direct, and to meet installation schedules.
- .4 Package fire rated materials with labels attached.

### 1.5 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 When ambient outdoor temperatures are below 12°C maintain continuous, uniform comfortable building working temperatures of not less than 12°C for a minimum period of 48 hours before, during and following application of gypsum board and joint treatment materials or bonding of adhesives.
- .3 Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.
- .4 Protection:
  - .1 *Provide* adequate protection of materials and work of this section from damage by weather and other causes. Protect work of other trades from damage resulting from work of this section. Make good such damage at no additional cost to the *Owner*.
  - .2 Exterior sheathing board's exposure to weather: Comply with manufacturer's printed instructions. Provide protection prior to exposure for periods greater than manufacturer's recommendations and warranty.

## PART 2 – PRODUCTS

### 2.1 Performance/Design Requirements

- .1 Fire resistance rating:
  - .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.

### 2.2 General

- .1 Single source responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

### 2.3 Gypsum Board Panels

- .1 Plain gypsum board for dry locations, GWB-STD:
  - .1 Standard:
    - .1 Paper faced gypsum core panel solid set core enclosed in paper, 12.7 mm (1/2") or 16 mm (5/8") thick unless otherwise indicated, 1220 mm (48") wide x maximum practical length, ends square cut, tapered edges, to ASTM C1396/C1396M-11.

Gypsum and Cement Board

---

- .2 Acceptable *Products*:
  - .1 CertainTeed 'Regular Gypsum Board'.
  - .2 CGC 'SHEETROCK Gypsum Panel, Regular'.
  - .3 Georgia-Pacific 'ToughRock Gypsum Board'.
  - .4 Lafarge 'Gypboard'.
  - .5 National Gypsum 'Gold Bond Gypsum Board'.
- .2 Fire-rated gypsum board:
  - .1 Paper faced gypsum core panel with a specially formulated core for use in fire-resistive Type X or Type C designs, to ASTM C1396/C1396M-11.
  - .2 Acceptable *Products*:
    - .1 CertainTeed 'Type X and Type C'.
    - .2 CGC 'SHEETROCK Firecode and Firecode C'.
    - .3 Georgia-Pacific 'ToughRock Fireguard and Fireguard Gypsum Board'.
    - .4 Lafarge 'Firecheck C and X'.
    - .5 National Gypsum 'Gold Bond Fire-Shield and Fire Shield C Gypsum Board'.
- .2 Abuse resistant gypsum board, GWB-AR:
  - .1 Mould and moisture resistant, fire rated Type X.
  - .2 Abuse resistance performance:
    - .1 Surface abrasion surface damage: Level 3 to ASTM C1629.
    - .2 Surface indentation surface damage: Level 1 to ASTM D5420.
    - .3 Soft-body impact penetration: Level 1 to ASTM E695.
  - .3 Thickness: 15.9 mm (5/8") minimum.
  - .4 Acceptable *Products*:
    - .1 CertainTeed 'Air-Renew Extreme Abuse Resistant Board'.
    - .2 CGC 'Sheetrock Brand Panels Mold Tough AR'.
    - .3 Georgia-Pacific 'DensArmor Plus Abuse-Resistant Panel'.
    - .4 National Gypsum 'High-Abuse XP'.
    - .5 Lafarge 'Protecta AR 100 Type X with Mold Defense'.
- .3 Impact resistant gypsum board, GWB-IR:
  - .1 Mould and moisture resistant, fire rated Type X.
  - .2 Impact resistance performance:
    - .1 Surface abrasion surface damage: Level 3 to ASTM C1629.
    - .2 Surface indentation surface damage: Level 1 to ASTM D5420.
    - .3 Soft-body impact penetration: Level 3 to ASTM E695.

Gypsum and Cement Board

---

- .4 Hard-body impact penetration: Level 2 to ASTM C1629.
- .3 Thickness: 15.9 mm (5/8")) minimum.
- .4 Acceptable *Products*:
  - .1 CertainTeed 'Air-Renew Extreme Impact Resistant Board'
  - .2 CGC 'Sheetrock Brand Panels Mold Tough VHI Firecode X'.
  - .3 Georgia-Pacific 'DensArmor Plus Impact-Resistant Panel'.
  - .4 National Gypsum 'High-Impact XP'.
  - .5 Lafarge 'Protecta HIR 300 Type X with Mold Defense'.
- .4 Gypsum tile backer board; for dry locations (GWB-TB):
  - .1 Glass scrim fibre faced or gypsum-fiber, water resistant gypsum board with moisture resistant core to ASTM C1178/C1178M-11
  - .2 Type X to ASTM C1658/C1658M-13.
  - .3 Thickness: Minimum 15.9 mm (5/8").
    - .1 Acceptable *Products*:
      - .1 CertainTeed 'GlasRoc Diamondback Tile Backer'.
      - .2 Georgia-Pacific 'Dens-Shield Tile Backer'.
      - .3 Substitutions: in accordance with Section 01 25 00.
- .5 Cement tile backer board; for wet locations (CBD-TB):
  - .1 Coated glass scrim tile backer board.
    - .1 Portland cement, sand, and expanded polystyrene beads, with a fully embedded alkali resistant glass fibre mesh facing.
    - .2 Free of gypsum, organic fibres or cellulose.
    - .3 Thicknesses:
      - .1 Ceilings: 12.7 mm (1/2") minimum.
      - .2 Walls: 16 mm (5/8") minimum.
  - .2 Acceptable *Products*:
    - .1 CGC 'Durock'.
    - .2 National Gypsum 'PermaBase Plus Cement Board'.
    - .3 Substitutions: in accordance with Section 01 25 00.
- .6 Core board, shaftwall assemblies, GWB-S:
  - .1 Glass scrim or paper faced gypsum core, 25 mm (1") thick, mould resistant glass scrim gypsum board, fire rated where indicated.
  - .2 Rating of 10 "No Mold Growth" to ASTM D3273-12.
- .7 Exterior sheathing board:
  - .1 Service grade: Exterior grade.

## Gypsum and Cement Board

---

- .2 Fibreglass mat faced on front and back sides and long edges, silicone-treated water-resistant core, to ASTM C1177/C1177M-08, fire rated where indicated.
  - .1 *Acceptable Products:*
    - .1 CertainTeed 'GlasRoc Sheathing'.
    - .2 CGC 'Securock Glass-Mat Sheathing'.
    - .3 Georgia-Pacific 'Dens-Glass Gold'.
    - .4 Lafarge 'Weather Defense Platinum Sheathing'.
- .8 Air barrier sheathing board:
  - .1 Fibreglass mat faced on front and back sides and long edges, water-resistant core, to ASTM C1177/C1177M-08, fire rated where indicated with air vapour affixed to surface.
    - .1 Basis of design:
      - .1 Georgia-Pacific 'DensElement Sheathing'.
  - .2 Fluid applied flashing membrane:
    - .1 Single component silyl-terminated polymer (STP) elastomeric flashing membrane.
    - .2 Basis of design:
      - .1 Porsoco 'R-Guard FastFlash'.

### 2.4 Cement Board

- .1 Cement board; interior and exterior grade, tile backer board applications:
  - .1 Composition:
    - .1 Portland cement, sand, and expanded polystyrene beads, with a fully embedded alkali resistant glass fibre mesh facing.
    - .2 Free of asbestos, gypsum, organic fibres or cellulose.
  - .2 *Acceptable Products:*
    - .1 CGC 'Durock'.
    - .2 National Gypsum 'PermaBase Plus Cement Board'.
    - .3 Substitutions: in accordance with Section 01 25 00.

### 2.5 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 to ASTM C1002-07/ASTM C954-11. 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.

### Gypsum and Cement Board

---

- .2 Screws; for exterior sheathing board: in accordance with manufacturer's installation instructions to comply with design wind loads.
- .3 Screws; for cement board: Wafer head, Type S-12 point or 'Hi-Lo', self-tapping, with corrosion resistant polymer finish.
- .4 Tie wire: 1.6 mm (0.063") diameter galvanized soft annealed steel wire.
- .5 Laminating adhesive; for gypsum panels only: in accordance with gypsum board manufacturer's printed installation instructions, to suit application.
  - .1 Use adhesives that have a VOC content of 50 g/L (1.8 oz/gal) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.6 Accessories

- .1 Accessories; acceptable products/basis of design: to ASTM C1047-14a 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 Internal wall vents at sheathing board:
  - .1 Preformed vent louvre, corrosion resistant metal construction, insect proof.
  - .2 Ventilation shall meet or exceed building code requirements and not less than 1/300 (vent/sheathing board faced cavity area).
- .3 Casing trim; "L" or "LC" beads:
  - .1 Bailey D200 and 4411, Nicholson Rollforming Metal Trim 200-A and 200-B fillable edge trim, 0.55 mm (0.022") base thickness commercial grade sheet steel with zinc wiped coating to ASTM A653/A653M-11 ; perforated flanges.
- .4 Corner bead:
  - .1 Bailey D100, Nicholson Rollforming No. 114, fillable edge trim, 0.55 mm (0.022") base thickness commercial grade sheet steel with zinc wiped coating to ASTM A653/A653M-11 ; perforated flanges.
- .5 Reveal trim at junctions to exposed masonry and concrete and where indicated:
  - .1 Gordon Series 300, 312-5/8, or matching style by Fry Reglet.
- .6 Reveal trim; at acoustic tile to gypsum board transitions and where indicated:
  - .1 Fry Reglet 'Drywall/Acoustical Reveal DRMD-50-50, or matching style by Gordon Interior Specialties.
- .7 Z reveal types:
  - .1 Fry Reglet DRMZ-625-100, or matching style by Gordon Interior Specialties.
  - .2 Fry Reglet DRMZ-625-50, or matching style by Gordon Interior Specialties.
  - .3 Fry Reglet DRMZ-25-25, or matching style by Gordon Interior Specialties.
- .8 Reveals and moldings at round columns:
  - .1 Column Collar, as manufactured by Fry Reglet or matching style by Gordon Interior Specialties.

Gypsum and Cement Board

---

- .2 Reveal Column Ring, as manufactured by Fry Reglet or matching style by Gordon Interior Specialties.
- .3 Wall Angle Column Ring, as manufactured by Fry Reglet or matching style by Gordon Interior Specialties.
- .9 Control joints:
  - .1 No. 093 Zinc Control Joint by CGC Inc. or approved alternate, certified by manufacturer for use at fire resistance rated assemblies.
  - .2 Fry Reglet DRM-50-25 2-PC, or matching style by Gordon Interior Specialties.
  - .3 093V Expansion Bead by Trim-Tex Drywall Products Inc.

**2.7 Related Support Assemblies and Backer Plates**

- .1 Wind bearing metal studs at wind bearing exterior assemblies: in accordance with Section 05 41 13.
- .2 Dimensional wood blocking at interior assemblies: in accordance with Section 06 10 53.
- .3 Metal support systems and backer plates at interior assemblies: in accordance with Section 09 22 00.

**2.8 Joint Treatment Materials**

- .1 General: Comply with ASTM C475/C475M-15.
- .2 Joint tape:
  - .1 Interior gypsum board: Paper.
  - .2 Glass-mat gypsum sheathing board: 10-by-10 glass mesh.
  - .3 Tile backing panels: As recommended by panel manufacturer.
- .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 manufacturer.
  - .2 Embedding and first coat: Use setting-type or taping compound as recommended by panel and trim manufacturers.
  - .3 Fill and finish coats: Use sanding type setting-type or taping compound as recommended by panel manufacturer.
- .4 Joint compound for exterior applications:
  - .1 Glass-mat gypsum sheathing board: As recommended by sheathing board manufacturer.
- .5 Joint compound for tile backing panels:
  - .1 Cementitious backer units: As recommended by backer unit manufacturer.
- .6 Skim coat: For final coat of Level 5 finish for glass-mat gypsum board, use:
  - .1 High-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

## **2.9 Acoustic Wall Assembly Materials**

- .1 Acoustic sealant; concealed locations: non-skinning butyl sealant, non-hardening, remains soft and tacky, to CGSB 19.21-M87:
  - .1 Sealant shall not deteriorate (stain or bleed into) painted surfaces.
  - .2 Acceptable *Products*:
    - .1 DAP 'Mono Acoustic Sealant'.
    - .2 Pecora 'BA98'.
    - .3 Quiet Solution 'QuietSeal'.
    - .4 Tremco 'Acoustical Sealant'.
- .2 Acoustic sealant; exposed locations: Interior paintable sealant in accordance with Section 07 92 00.
- .3 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.
- .4 Acoustic compound: premixed perlite plaster.
- .5 Insulation:
  - .1 INS-60:
    - .1 Acoustic (sound attenuation) insulation.
    - .2 Mineral-fibre formaldehyde-free sound attenuation batts: to CAN/ULC S702-09, Type 1, non-combustible to CAN/ULC-S114-05, formaldehyde-free.
  - .3 Acceptable *Products*:
    - .1 Johns Manville 'Sound-SHIELD'.
    - .2 CertainTeed 'Sustainable Insulation NoiseReducer'.
    - .3 Substitutions: in accordance with Section 01 25 00.

## **2.10 Access Doors**

- .1 Architectural recessed access doors, locations as indicated:
  - .1 Door: 14 gauge steel, 25.4 mm (1") recessed depth.
  - .2 Frame: 16 gauge steel, 25.4 mm (1") wide perforated flange of 24 gauge galvanized steel.
  - .3 Hinge: concealed pivot rod.
  - .4 Latch: flush, stainless steel cam latch.
  - .5 Finishes:
    - .1 Grey baked enamel coat.
    - .2 At ceramic tile: Type 316 stainless steel.
  - .6 Basis of design:

Gypsum and Cement Board

---

- .1 Williams Bros. Corporation of America 'WB RDW 410 Series Recessed for Drywall Access Door'.

### **PART 3 - EXECUTION**

#### **3.1 Installation**

- .1 General: Comply with ASTM C840-16, GA 216-13, GA 600-12, and manufacturer's instructions, except as otherwise indicated. Do not bridge building expansion joints with support system. 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.
- .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 Securely attach trim, casings, framing, and accessories.
- .6 Apply components of fire-rated assemblies in conformance with indicated designs.
- .7 Erect materials to dimensions indicated, plumb, level, straight, and square to adjoining elements.
- .8 Do not apply gypsum board in close proximity to hot pipes or heating ducts.
- .9 Install materials with the minimum number of joints. Tightly butt joints, without force, and neatly align them.
- .10 Frame openings on every side. Provide clearances with services.
- .11 Work shall include bulkheads over doors, frames, screens, and changes in ceiling levels, pipe space and as indicated.
- .12 Provide clearances between work of this section and structural elements to prevent transference of structural loads in accordance with Section 09 22 00.
- .13 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.

### Gypsum and Cement Board

---

- .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").

### 3.3 Board Application - General

- .1 Before application of gypsum board commences, ensure that internal services have been installed, tested, and approved; that 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, center of joints. 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 At laminated plain gypsum board locations: Apply adhesive with notched spreader to leave ribbons 10 mm x 13 mm (3/8" x 1/2") at 38 mm (1-1/2") apart over entire back side of face layer. Erect board immediately after spreading adhesive. Temporarily secure face boards with screws or bracing to ensure adequate bond until adhesive sets. Temporary face screws may also be used. Substrate shall be fully cured and sufficiently dry to allow adhesive to fully cure and not re-emulsify.
- .9 Offset gypsum board joints 150 mm (6") minimum from corners of openings.
- .10 Gypsum panel product joints shall be located so that no joint will align with the edge of an opening unless control joints are to be installed at these locations.

Gypsum and Cement Board

---

### **3.4 Exterior Sheathing Board Application – Gypsum Sheathing Board**

- .1 Install sheathing in accordance with manufacturer's instructions and applicable instructions in GA 253-12 ASTM C1280-13, and ASTM C1397-13. 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. Sheathing joints shall be staggered, 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.
- .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 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").
- .7 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.
  - .2 Maximum gap between board joints: 1.6 mm (1/16").
- .8 Replace damaged or weathered sheathing boards.

### **3.5 Air Barrier Sheathing Board**

- .1 Install sheathing in accordance with manufacturer's instructions.
- .2 Treat countersunk fasteners penetrating through fibreglass mat with fluid applied flashing membrane.
- .3 Seal sheathing joints, rough openings, penetrations, and sheathing material transitions with fluid applied flashing membrane in accordance with sheathing and flashing membrane manufacturer's instructions.

### **3.6 Abuse Resistant Board Application**

- .1 Install abuse resistance gypsum board similarly to gypsum board as described above, and in accordance with manufacturer's instructions.
- .2 In corridors where gypsum board application is indicated or scheduled, install abuse/abrasion resistant boards for portions of wall below 2400 mm and as indicated or scheduled.
- .3 Where both abuse resistant gypsum panels and regular gypsum panels are used together on the same surface, ensure a smooth transition between the two types of panels. Finish the work in a manner such that the transition is not noticeable upon completion.

## Gypsum and Cement Board

---

### 3.7 Impact Resistant Board Application

- .1 Install impact resistance gypsum board similarly to gypsum board as described above, and in accordance with manufacturer's instructions.
- .2 In corridors where gypsum board application is indicated or scheduled, install abuse/abrasion resistant boards for portions of wall below 2400 mm and as indicated or scheduled.
- .3 Where both impact resistant gypsum panels and regular gypsum panels are used together on the same surface, ensure a smooth transition between the two types of panels. Finish the work in a manner such that the transition is not noticeable upon completion.

### 3.8 Interior Tile Backer Board Application

- .1 Install in accordance with manufacturer's specifications.
- .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 Apply tile backer board full height unless otherwise indicated, and in accordance with manufacturer's installation instructions.
- .4 Fastener spacing:
  - .1 Walls: fasten at 150 mm (6") on centre at vertical butt joints and 210 mm (8") on centre in field.
  - .2 Ceilings: fasten at 150 mm (6") on centre.
- .5 Maintain 6 mm (1/4") gap between board and shower base as applicable.

### 3.9 Interior Cement Board

- .1 Apply cement board with rough side towards interior, as and with ends applicable, and edges over supports. Fit ends and edges closely, but not forced together. Stagger end joints in successive courses.
- .2 Fasten cement board to framing with specified fasteners. Drive fasteners in field of cement board first, working toward ends and edges. Hold cement board in firm contact with framing while driving fasteners. Space fasteners along framing with perimeter fasteners at least 9.5 mm (0.374") and less than 15.9 mm (5/8") from ends and edges. Drive fasteners so bottom of heads are flush with surface of cement board to provide firm board contact with framing. Do not drive fastener heads below panel surface.
  - .1 Maximum fastener spacing as follows:
    - .1 Walls: 200 mm (8").
    - .2 Ceiling: 150 mm (6").
    - .3 Perimeters: minimum 9.5 mm (3/8") and maximum 15.9 mm (5/8") from ends and edges.

### 3.10 Acoustic Wall Assemblies

- .1 Acoustical sealant and plaster:
  - .1 Apply acoustical sealant to seal gaps in accordance with applicable requirements of ASTM C919-12.

### Gypsum and Cement Board

---

- .2 Apply bead of acoustic sealant to seal both sides of partition assembly between gypsum board and adjacent floor, wall, and ceiling assembly of partitions which contain sound attenuation insulation, and where noted.
- .3 Apply bead of acoustic sealant to seal both sides of partition assembly at top and bottom of control joints.
- .4 Apply bead of acoustic sealant to seal intersections with sound-isolating partitions that are extended to reduce sound flanking paths.
- .5 Apply bead of acoustic sealant to seal joint between penetrations and gypsum board.
- .6 Completely seal objects at wall and gypsum board penetrations (such as electrical boxes, piping, and fasteners) with heavy coating of premixed perlite plaster.
- .7 Apply sealant to clean, dry surfaces.
- .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 instructions.
  - .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.

### 3.11 Finishing

- .1 Provide levels of gypsum board finish for locations as follows, in accordance with GA-214.

Gypsum and Cement Board

---

- .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 4: Exposed gypsum board surfaces, except where another finish level is indicated.
- .4 Level 5: Exposed gypsum board surfaces as indicated on Drawings.
- .2 Interior gypsum board:
  - .1 Prefill:
    - .1 Use setting-type joint compound. Mix joint compound according to manufacturer's directions.
    - .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 Joint gaps not greater than 3.2 mm (1/8") shall be prefilled with either ready-mix or setting type joint compound; joint gaps greater than 3.2 mm (1/8") shall be prefilled with setting-type joint compound.
  - .2 Taping (Level 1):
    - .1 Butter taping compound into inside corners and joints.
    - .2 Center 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 instructions.
    - .3 Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.
    - .4 Fastener heads and accessories shall be covered 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.
    - .1 Fastener heads and accessories shall be covered 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.

Gypsum and Cement Board

---

- .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 Fastener heads and accessories shall be covered with total of 3 separate coats of joint compound.
- .6 Skim coat (Level 5):
  - .1 After the fourth coat has dried, apply skim coat of topping or all-purpose drying-type compound over exposed surfaces of gypsum board.
  - .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 Cement board: Prepare, tape, and finish joints in accordance with manufacturer's instructions.
- .4 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").
- .5 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.
- .6 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; including interior gypsum board, and exterior sheathing board with exterior finish system specified in Section 07 24 40 Coordinate with Section 05 41 13.
    - .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:

---

Gypsum and Cement Board

---

- .1 Linear dimensions between control joints shall not exceed 15000 mm (50 ft) and total area between control joints shall not exceed 230 m<sup>2</sup> (2500 ft<sup>2</sup>).
- .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 m<sup>2</sup> (900 ft<sup>2</sup>).
- .6 Install control joints where ceiling framing members change direction.
- .7 Where a control joint occurs in an acoustical or fire-rated system, blocking shall be provided 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.
- .11 Board joints shall be located 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 - Architectural

- .1 Locations to be reviewed and confirmed by *Consultant*.
- .2 Install in accordance with manufacturer's written instructions.
- .3 Install before gypsum or cement board has been taped and finished.
- .4 Fasten frame to gypsum board with standard gypsum board fasteners.

Gypsum and Cement Board

---

**3.14 Adjusting and Cleaning**

- .1 Remove debris and rubbish from wall and ceiling cavities before enclosing with board.
- .2 Clean up and remove surplus materials and rubbish resulting from the work of this section upon completion.
- .3 Clean off beads, casings, joint compound droppings and the like, leave the work of this section ready for painting trades.

**END OF SECTION**

Interior Gypsum and Cement Board Schedule

**1.0 Locations Schedule**

Product Abbreviations, interior sheathing : GWB-STD: Standard gypsum wall board, plain and fire-rated. GWB-AR: Abuse Resistant, mould resistant gypsum board, fire-rated. GWB-IR: High Impact Resistant, mould resistant gypsum board, fire-rated. GWB-TB: Glass reinforced gypsum tile backer board. CBD-TB: Cement tile backer board.	
Where gypsum or cement board are indicated, apply the product type scheduled below.	
Locations	Interior sheathing board type.
<b>Public Areas including lobbies, corridors and rooms</b>	
Walls to 2400mm AFF	GWB-IR
Walls; tiled	GWB-TB
Walls above 2400mm AFF	GWB-STD
Ceilings	GWB-STD
<b>Offices and Admin Areas</b>	
Walls	GWB-STD
Ceilings	GWB-STD
<b>Change Rooms - dry areas</b>	
Ceilings	GWB-AR
<b>Change Rooms - wet areas</b>	
Ceilings; tile finish	CBD-TB
<b>Pool areas</b>	
Bulkhead assemblies behind Metal Panelling system (parallel to grid 4)	GWB-TB with Fluid Applied Flashing system or, Air barrier sheathing board with Fluid Applied Flashing system.
Bulkhead assemblies behind Metal Panelling system (grids A,G, and 7)	GWB-TB or Air barrier sheathing board.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Hard surface tiling.
  - .2 Mortar bed for tiling.
  - .3 Thin-set adhesives for tiling.
  - .4 Levelling underlayment.
  - .5 Waterproofing under indicated tile assemblies.
  - .6 Trim accessories.
- .2 Section excludes:
  - .1 Hard surface tiling and waterproofing systems for pool tank and deck.
    - .1 Hard surface tiling and waterproofing systems for pool tank and deck are specified under Section 13 11 13.

### **1.2 Administrative Requirements**

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
- .2 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.

### **1.3 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 installation instructions for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
  - .1 Indicate location of expansion and control joints.
- .4 Samples:
  - .1 Submit 3 -full size samples of each type of tile specified.
  - .2 Submit 3 - 305 mm (12") long samples trim accessory.
- .5 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.

Tiling

---

#### 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 minimum 4% 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.

#### 1.5 Quality Assurance

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 Execute work of this section only by a *Subcontractor* 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.
    - .2 *Subcontractor* 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 Non-grouted mock-up: 1220 mm x 1220 mm (48" x 48") area for each type and colour, texture, size, and pattern of tile.
  - .3 Install each product and colour mock-up for acceptance by *Consultant*. Accepted mock-up shall form basis of standard of workmanship for remainder of work. Mock-up shall consist of floor/wall/base corner intersection including cove base inside and outside corners, with 300 mm (12") of finish product on each face.

#### 1.6 Field Conditions

- .1 Execute work of this section while temperature is maintained within safe working temperatures in accordance with manufacturer's installation instructions for a period of 72 hours before, during and following installation. Avoid concentrated or irregular heating during curing period.
- .2 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.

#### 1.7 Warranty

- .1 Tiling system manufacturer's system warranty including the following:
  - .1 Labour, materials, and workmanship 10 year system warranty.

## **PART 2 – PRODUCTS**

### **2.1 General**

- .1 Single source responsibility: In any given space, use adhesive and grout from a single manufacturer.
  - .1 In locations requiring waterproofing under tiled assemblies, adhesive and grout shall be of same manufacturer as waterproofing.
- .2 Tile products shall be from same production run, dye lot, calibre, and batch number. If shading variation is evident, notify *Consultant* prior to installation.

### **2.2 Tile Products**

- .1 Acceptable *Products*:
  - .1 Refer to Section 09 31 01 Tile Schedule.
  - .2 Substitutions: in accordance with Section 01 25 00.
- .2 Specialty Tiles:
  - .1 *Provide* specialty tiles for external and internal corners, angles and coved bases.
  - .2 *Provide* nosing, stretcher and cove tiles to match size, colour and finish of adjacent tiles, unless otherwise indicated.
- .3 Refer to Section 09 31 01 Tile Schedule for specific tile *Products*.
- .4 Refer to Drawings, Room Finish Schedule, and Tile Schedule for extents of tile locations.

### **2.3 Adhesive, Mortar, and Grout Materials**

- .1 Acceptable manufacturers (basis of design):
  - .1 Laticrete International, Inc.
  - .2 Mapei.
  - .3 Refer to Adhesive, Mortar, and Grout Materials schedule in Section 09 31 01 Tile Schedule for specific acceptable *Products*.
- .2 Acceptable manufacturers (alternative):
  - .1 Flextile and TEC Systems are acceptable upon provision of full system information and warranties to match specified products and receipt of prior approval in writing from the *Consultant*.
- .3 For tile installations on sheet waterproofing membrane: Refer to paragraph 2.3 of Section 09 31 00 – “Sheet Waterproofing Membrane Materials”.
- .4 Primer: Low VOC, low viscosity primer as recommended by manufacturer to suit substrate and site conditions.
- .5 Fortified Mortar Bed and Levelling Coat:
  - .1 To ANSI A118.7 (ANSI A108/A118/A136.1-2013).
  - .2 Acceptable *Products*/manufacturers:
    - .1 Laticrete 3701 Fortified Mortar Bed.

Tiling

---

- .2 Mapei Mapecem 202.
- .3 Tec Systems.
- .6 Self Levelling and Smoothing Underlayment:
  - .1 Cementitious self levelling smoothing underlayment meeting or exceeding requirements of ANSI A108.1 (ANSI A108/A118/A136.1-2013), Type 2.
- .7 Wall tile systems:
  - .1 Thin Set and Medium Set Interior system: to ANSI A118.1 (ANSI A108/A118/A136.1-2013) and ANSI A118.4 (ANSI A108/A118/A136.1-2013).
- .8 Floor tile systems:
  - .1 Thin Set and Medium Set Interior system: to ANSI A118.1 (ANSI A108/A118/A136.1-2013) and ANSI A118.4 (ANSI A108/A118/A136.1-2013).
- .9 Polymer Modified Grout:
  - .1 Factory blended stain resistant polymer modified Portland cement meeting to ANSI A118.7 (ANSI A108/A118/A136.1-2013), specifically formulated for joints greater than 3 mm (1/8") in width and as follows.
- .10 Epoxy Grout:
  - .1 Water cleanable, chemical resistant, factory blended modified Portland cement compound with epoxy additives and hardeners to ANSI A118.3 (ANSI A108/A118/A136.1-2013).
- .11 Grout colours to later selection by *Consultant* from manufacturer's full range.
- .12 Grout sealer: as recommended by grout manufacturer.

## 2.4 Waterproofing Membrane Materials

- .1 Waterproof membrane locations and extents: as indicated.
- .2 Waterproofing membrane; interior intermittent water conditions:
  - .1 Thin, flexible, liquid or trowel applied, load bearing waterproofing system. Membrane materials meet or exceed ANSI A118.10 (ANSI A108/A118/A136.1-2013) and ANSI A118.12 (ANSI A108/A118/A136.1-2013) and IAPMO certificate of listing as a shower pan liner. Materials to be non-toxic, non-flammable, and non-hazardous during storage, mixing, application and when cured.
  - .2 Accessories:
    - .1 Reinforcing fabric to be non-woven rot-proof specifically intended for waterproofing membrane as recommended by waterproofing manufacturer.
    - .2 Mortar; for setting tile: Compatible product as recommended by waterproof membrane manufacturer.
  - .3 Acceptable *Products*:
    - .1 Laticrete 'Hydro Ban'.
    - .2 LATICRETE 9235 Waterproofing Membrane as manufactured by LATICRETE International, Inc.

Tiling

---

.3 Mapei 'Mapelastic AquaDefense'.

## 2.5 Accessories and Related Materials

.1 Trim accessories:

.1 Finishing and edge protection; floors and walls:

.1 Basis of design:

.1 Schluter Systems 'JOLLY', clear satin nickel anodized aluminum finish, sizes to suit installation conditions.

.2 For internal wall corners and wall/floor joints in applications where only slight movement occurs:

.1 Basis of design:

.1 Schluter 'DILEX-HKW'.

.3 Floor transitions:

.1 Tile to adjacent floor finish with flush condition:

.1 Basis of design:

.1 Schluter 'SCHIENE', anodized aluminum finish.

.2 Tile to adjacent floor finish at lower elevation not exceeding 13 mm (1/2"):

.1 Basis of design:

.1 Schluter 'RENO-U', anodized aluminum finish.

.3 Tile to adjacent floor finish at lower elevation exceeding 13 mm (1/2") or to finished concrete:

.1 Basis of design:

.1 Schluter 'RENO-RAMP/-K', anodized aluminum finish.

.2 Joint sealants: mildew resistant sealant in accordance with Section 07 92 00 or as recommended by waterproofing membrane and grout manufacturer.

.3 Movement and control joint sealant:

.1 One-component, neutral cure, marine grade silicone sealant.

.2 Tensile Strength (ASTM C794-15a): 1.5 MPa (225 psi).

.3 Hardness (ASTM D751-06(2011); Shore A): 25 (coloured sealant)/15 (clear sealant)

.4 Weather Resistance (QUV Weatherometer): 10000 hours (no change)

.5 Acceptable *Products*/manufacturers:

.1 Mapei.

.2 Latricrete 'Latasil Tile and Stone Sealant' with '9118 Primer'.

.3 Tec Systems.

Tiling

---

## 2.6 Mixes

- .1 Mix premanufactured mortars and grouts in accordance with referenced standards, and mortar and grout manufacturer's written instructions.

## 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 instructions and in ANSI A108.5 (ANSI A108/A118/A136.1-2013) 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 General:
  - .1 Ensure surfaces are dimensionally stable, cured free of contaminants such as oil, sealants and cured compound. Ensure concrete cures for a minimum of 90 days with a steel trowel and fine broom finish for thin set applications and a screed finish for mortar bed applications.
  - .2 Prepare substrates in accordance with adhesive / waterproofing system manufacturer's instructions.
  - .3 Prime concrete with primer, brush or roller applied at full strength in accordance with adhesive / waterproofing system manufacturer's instructions
- .2 Floor surfaces:
  - .1 Prepare concrete to receive levelling underlayment in accordance with International Concrete Repair Institute (ICRI) designation CSP-3.
  - .2 Prepare concrete to receive liquid or trowel applied waterproofing membrane in accordance with International Concrete Repair Institute (ICRI) designation CSP-2.
  - .3 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion or performance or may act as bond breaker .
  - .4 Wire brush steel substrates to remove deleterious substances and rust, to promote full adhesion to steel.
  - .5 Concrete shall be minimum of 90 days old.

## Tiling

---

- .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 Where substrate varies beyond the limits of the following:
  - .1 Mortar bed application substrate surface variation greater than 6 mm in 3000 mm (1/4" in 10'), apply levelling underlayment.
  - .2 Thin set application substrate surface variation greater than 3 mm in 3000 mm (1/8" in 10') up to 8 mm (5/16") thickness, apply levelling underlayment. Above 8 mm (5/16") correct irregularity by mortar bed method.
- .8 Levelling Underlayment:
  - .1 Where substrate varies beyond limitations, prime substrate, mix and apply underlayment in accordance with manufacturer's instructions.
- .3 Wall surfaces:
  - .1 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.
  - .2 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion or performance or may act as bond breaker.
  - .3 Prime gypsum, wood or porous concrete with primer, brush or roller applied at full strength in accordance with adhesive manufacturer's recommendations.

### 3.3 Mixing

- .1 Mix mortars, additives and grouts in accordance with manufacturer's requirements.
- .2 Rotating blade mechanical mixer: Pour latex additive, start mixer and add sand first, followed by Portland cement. Mix no mortar in same mixer as a dissimilar type of mortar unless the mixer is first thoroughly washed clean.
- .3 Pail batch mixing with low revolution drill mixers as follows:
  - .1 Premix separately prior to adding to the latex additive.
  - .2 Pour latex additive into clean mixing vessel and add dry materials slowly while mixing into a homogeneous and smooth consistency.

### 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 instructions to produce a smooth, flat surface.

## Tiling

---

- .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 dry prior to installation of tile.

### 3.5 Installation - General

- .1 Install products in accordance with manufacturer's specifications and as indicated herein.
- .2 Install in accordance with TTMAC Specification Guide 09 30 00 Tile Installation Manual TTMAC 2012-2014 Specification Guide 09 30 00, Tile Installation Manual, except where specified otherwise.
- .3 Install in accordance with ANSI A108.5 (ANSI A108/A118/A136.1-2013) and ANSI A108.10 (ANSI A108/A118/A136.1-2013).
- .4 Make joints even, straight, plumb and of uniform width.
- .5 Provide mortar beds and levelling coats in accordance with TTMAC details.
- .6 At floor drains in mortar bed: *Provide* slopes to drains as required by applicable codes and regulations, and as indicated.
- .7 *Provide* edge protection at tile edges and corners, unless otherwise indicated, using maximum length pieces.
- .8 *Provide* edge protection and transition strips at tile transitions, unless otherwise indicated, using maximum length pieces.
- .9 Review locations of tile accessories with *Consultant* prior to setting tile and comply with directions of *Consultant*.
- .10 Caulk around pipes and openings made in tile with sealant.
- .11 Apply sealant at interface with frames at openings. Apply sealant in accordance with Section 07 92 00 and manufacturer's instructions.
  - .1 Sealant colour to later selection by *Consultant*.
- .12 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.

### 3.6 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.

### Tiling

---

- .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.
- .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 all 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/A136.1-2013 series of tile installation standards for the following:
  - .1 Tile in wet areas.
  - .2 Tile having tiles 300 mm (12") or larger in any direction.
- .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 all cracked or damaged tile.
- .13 Form external angles with round edge tile extending over edge of square edge adjacent tile. Internal angles shall be formed square, carrying 1 flat tile past edge of other.
- .14 Extend tile into recesses at windows, doors, or other openings.
- .15 Extend tiles 100 mm (4") behind mirrors, and fully behind cabinets, cupboards and other fixed objects at walls.
- .16 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.
- .17 Install tiles to provide even distribution of shading, colour, and characteristics.
- .18 Install waterproof membrane to locations as indicated or scheduled to provide watertight performance.

### 3.7 Waterproofing Membrane Installation

- .1 Install waterproof membrane to locations as indicated or scheduled to provide watertight performance.
- .2 Install waterproofing to comply with ANSI A108.13 (ANSI A108/A118/A136.1-2013) and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- .3 Prepare substrate in accordance with manufacturer's instructions and specified International Concrete Repair Institute (ICRI) designation.

## Tiling

---

- .4 Remove dust, dirt, oil, grease, paint, laitance, efflorescence, curing compounds, sealers, water repellents and other materials that prevent bond. Metal plumbing pipe penetrations and fixtures must be clean of oil, grease, rust and other potential bond breakers.
- .5 Work waterproofing membrane into adhesive with a flat trowel to achieve full contact and to remove air pockets.
- .6 Install prefabricated corners at outside and inside corner conditions.
- .7 Install prefabricated pipe collars at penetrations.
- .8 Install waterproofing strips at corner conditions at change in substrate plane conditions and where required by manufacturer's installation instructions.
- .9 Provide strips of waterproofing where required to span expansion joints or terminate waterproofing into movement joint type tile setting accessories, in accordance with manufacturer's instructions.
- .10 Seal waterproofing at penetrations and terminations in accordance with manufacturer's installation instructions.

### 3.8 Mortar-Bed Tiling

- .1 Apply latex-Portland cement thin bed mortar with flat trowel as a slurry bond coat approximately 1.5 mm (1/16") thick over clean concrete slab.
- .2 Place latex-Portland cement thick bed mortar over slurry bond coat while bond coat is wet and tacky. Omit reinforcing wire fabric and fully compact bed by tamping.
- .3 Spread latex-Portland cement thin bed mortar with flat trowel over surface of "green"/fresh mortar bed as a slurry bond coat approximately 1.5 mm (1/16") thick.
- .4 Apply latex-Portland cement thin bed mortar slurry bond coat to back of tile or threshold and place each piece/sheet while slurry bond coats are wet and tacky. Beat with a hardwood block or rubber mallet to level/imbed pieces before mortar bed takes initial set.
- .5 Clean excess mortar from finished surfaces.
- .6 For installation of tile over cured (pre-floated) latex-Portland cement thick bed mortar, follow Thin-Set Method.

### 3.9 Thin-Set Method

- .1 Use the appropriate trowel notch size to ensure full bedding of the tile.
- .2 Work the thin-set mortar into good contact with the substrate and comb with notched side of trowel.
  - .1 Flat trowel thin-set mortar to consistent thickness for glass tile installations.
- .3 Beat each piece/sheet into the thin-set mortar with a beating block or rubber mallet to insure full bedding and flatness.
- .4 Clean excess thin-set mortar from tile face and joints between pieces.
- .5 Do not cover, bridge or fill tile joints located over expansion joints with adhesive.

### 3.10 Control and Movement Joints

- .1 Carry substrate control and movements joints through to tile work.

Tiling

---

- .2 Install control joints around the perimeter of tiled areas, around columns and where tile abuts other hard materials.
- .3 Incorporate expansion joints over building movement joints.
- .4 Cut tiles on both sides along the edges of control or movement joints.
- .5 Provide control joints in floors and walls at perimeters of floor and within 4800 mm to 6100 mm (16 ft to 20 ft) centre to centre by raking out joints to full depth of tile and cleaning joints for application of sealant in accordance with Section 07 92 00. In areas subject to sunlight or exposed to exterior provide control joints within 2400 mm to 3700 mm (8 ft to 12 ft) centre to centre.
  - .1 Review locations with *Consultant* prior to setting tile and comply with instruction given by *Consultant*.
- .6 Control joint width: 6.4 mm (1/4") minimum, 9.5 mm (3/8") in areas subject to sunlight, 12.7 mm (1/2") for exterior applications, unless indicated otherwise.

**3.11 Trim Accessories Installation.**

- .1 Coordinate transitions with work of other sections.
- .2 Install trims in accordance with manufacturer's installation instructions.
- .3 Install in continuous lengths.
- .4 Scribe and fit to obstructions.
- .5 Cope mitre corners.

**3.12 Grouting**

- .1 Install grout to comply with ANSI A118.4 (ANSI A108/A118/A136.1-2013) unless otherwise specified and in accordance with manufacturer's printed instructions.
- .2 Allow tile installation to cure a minimum of 24 hours at ambient temperature of 21°C (69°F) prior to grouting.
- .3 Verify grout joints are free of dirt, debris, water or tile spacers and face of tiles are clean.
- .4 Apply grout release to face of absorptive, abrasive, non-slip or rough textured tile units that are not hot paraffin coated to facilitate cleaning.
- .5 Spread using a sharp edged, hard rubber float and work grout into joints using 45° diagonal strokes.
- .6 Pack joints full and free of voids/pits. Stroke diagonally to remove excess grout and to avoid pulling grout out of filled joints.
- .7 Once excess grout is removed, begin cleaning grout haze before grout is fully cured. Using a circular motion, lightly scrub grouted surfaces with the damp sponge to dissolve grout film/haze. Drag sponge diagonally over scrubbed surfaces to remove froth. Rinse sponge frequently and change rinse water at least every 2 m<sup>2</sup> (200 ft<sup>2</sup>). Repeat cleaning sequence again if grout haze is still present.
- .8 Allow grout joints to become firm. Buff surface of grout with clean coarse cloth. 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.

## Tiling

---

- .9 Chemical resistant, water cleanable tile-grouting epoxy (ANSI A118.3 (ANSI A108/A118/A136.1-2013)):
  - .1 Install chemical epoxy resistant grout in compliance with current revisions of ANSI A108.1 (ANSI A108/A118/A136.1-2013) and ANSI A108.10 (ANSI A108/A118/A136.1-2013).
  - .2 Once excess grout is removed, begin cleaning grout haze approximately 20-30 minutes after grouting depending on temperature. Using a circular motion, lightly scrub grouted surfaces with the damp sponge to dissolve grout film/haze. Drag sponge diagonally over scrubbed surfaces to remove froth. Rinse sponge frequently and change cleaning solution at least every 4.7 m<sup>2</sup> (50 ft<sup>2</sup>).
  - .3 Within 1 hour of finishing first cleaning, clean the same area again following the same procedure but utilizing a clean white scrub pad and fresh cleaning solution. Rinse scrub pad frequently. Drag a clean sponge diagonally over scrubbed surfaces to remove froth. Use each side of sponge only once before rinsing and change cleaning solution at least every 4.7 m<sup>2</sup> (50 ft<sup>2</sup>). Allow cleaned areas to dry and inspect tile surface. Rinse with clean water and allow surface to dry. Inspect grout joint for pinholes/voids and repair them with freshly mixed grout.
- .10 Grout joint width to be 3.2 mm (1/8") unless otherwise indicated and except as follows:
  - .1 For tiles larger than 150 mm x 150 mm (6" x 6") or thicker than 13 mm (1/2"), grout joint width to be 6 mm (1/4").
  - .2 For mosaic tiles joints between mosaic tile sheet to be the same as joints between mosaic tiles.
- .11 Do not cover, bridge or fill any expansion joints in tile with grout.

### 3.13 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).

### 3.14 Adjusting and Cleaning

- .1 Clean tile surfaces so they are free of foreign matter using manufacturer recommended cleaning products and methods after completion of placement and grouting and as follows:
  - .1 Remove grout residue from tile after grouting has cured.
  - .2 Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.
  - .3 Flush surface with clean water before and after cleaning.
- .2 Re-point joints after cleaning to eliminate imperfections.

Tiling

---

**3.15 Protection:**

- .1 Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies as follows:
  - .1 Prohibit traffic during installation and for minimum 96 hours after installation.
  - .2 Protect finished areas from traffic until setting materials have sufficiently cured in accordance with TTMAC requirements.
  - .3 Protect floor areas from traffic after grouting is completed in accordance with manufacturer's written instructions.
  - .4 Prevent foot and wheel traffic from floors for a minimum of 96 hours after completion of grouting.
  - .5 Protect wall tiles and bases from impact, vibration, heavy hammering on adjacent and opposite walls for a minimum of 7 days after installation.
  - .6 Install floor protection in areas where other work, repairs and installation or equipment and foot traffic will occur. Lap joints of protective cover material by 150 mm (6") and seal with non-asphaltic tape.

**END OF SECTION**

## Tiling Schedule

---

### 1.0 Tiling Schedule:

- .1 Tile, basis of design:
  - .1 Mosaics (25mm x 25mm and 50mm x 50mm):
    - .1 American Olean Unglazed Colorbody Porcelain Mosaics .
  - .2 Centura International Tile. Contact: Elizabeth Livingston, tel. 416-785-5165
    - .1 Centura International
- .2 Specialty Tiles: Provide specialty tiles for external and internal corners, angles and coved bases. Provide nosing, stretcher and cove tiles to match size, colour and finish of adjacent tiles, unless otherwise indicated.
- .3 Trim, basis of design:
  - .1 Perimeter and corner trim Schluter Systems 'JOLLY'
    - .1 Finish for white coloured tile: clear satin anodized aluminum finish, sizes to suit thickness of tile.
    - .2 Finish for charcoal/black coloured tile: Custom Spray Coating; Acrynar 2 Coat System; Colour: To match tile type TL11 to Consultants Approval.
  - .2 Internal Wall corners and wall/floor joints in applications where only slight movement occurs Schluter 'DILEX HKW' clear satin anodized aluminum finish, sizes to suit thickness of tile.
  - .3 Floor Transitions with Flush Condition Schluter Systems 'SCHIENE' clear satin anodized aluminum finish, sizes to suit thickness of tile.
  - .4 Floor Transitions not flush conditions not exceeding 13mm Schluter Systems 'RENO U' clear satin anodized aluminum finish, sizes to suit thickness of tile.
  - .5 Floor Transitions not flush conditions exceeding 13mm Schluter Systems 'RENO PAMP K' clear satin anodized aluminum finish, sizes to suit thickness of tile.
- .4 Refer to drawings for locations and extent of tile.

Tiling Schedule

.5 Tile Schedule

	General Location	Size	Basis of Design Product	Finish	Colour
	<b>Floor Tile</b>				
<b>TL01</b>	Public Washrooms and Change Rooms	50mm x 50mm	American Olean Unglazed Colour Body	Standard	Storm Grey Speckled A06
<b>TL02</b>	Change Room Showers	50mm x 50mm	American Olean Unglazed Colour Body	Abrasive	Storm Grey Speckled A06
	<b>Wall Tile</b>				
<b>TL10</b>	Change Room Showers	100mmx400mm	Centura International	Gloss	White 416G
	<b>Ceiling Tile</b>				
<b>TL11</b>	Change Room Shower and WC areas and Universal Washroom	100mmx400mm	Centura International	Gloss	White 416G
	<b>Bench Tile</b>				
<b>TL15</b>	Corridor Benches near Viewing and Guard Staff Room	25 x 25	American Olean Unglazed ColorBody	Standard	Ice White A25
<b>Notes</b>					
<b>TL01</b>	Coved mosaic tile base.				
<b>TL02</b>	Coved mosaic tile base.				

## Tiling Schedule

### 2.0 Adhesives, Mortar and Grout Materials Schedule

	Laticrete System	Mapei System
<b>Thinset Mortar: Modified Portland Cement</b>	Laticrete 254 Platinum	Ultraflex 3 or Ultraflex LFT
<b>Thinset Mortar – Ceilings: Modified Portland Cement</b>	Laticrete 254 Platinum (Rapid as required)	Granirapid (2-component) or Ultraflex LFT
<b>Thinset Mortar – Natural Stone and Large Format tiles (dimension along any edge of 450mm or greater): Modified Portland Cement</b>	Laticrete 220 Marble & Granite with 3701 Mortar Admix	Granirapid (2-component)
<b>Grout: Polymer Modified Cement</b>	Laticrete PermaColor Grout	Ultracolor Plus
<b>Grout: Epoxy</b>	Laticrete SpectraLock PRO Grout	Kerapoxy
<b>Waterproofing Membrane – Intermittent conditions</b>	Laticrete 9235 with mesh or Laticrete HydroBan	Mapelastic AquaDefense

### 3.0 Tile Installation Schedule

- .1 Install in accordance with TTMAC Specification Guide 09 39 99 Tile Installation Manual (latest edition).

	Location	Waterproof Membrane	Thick Bed Mortar Leveling Coat (over Slurry Bond Coat)	Thin-Set Mortar (Adhesive)	Grout	TTMAC Details
.1	Floors Washrooms	No	No	Modified Portland Cement	Epoxy	310F
.2	Floors Change Rooms: Shower Rooms	Yes	Yes	Modified Portland Cement	Epoxy	310F
.3	Floors Change Rooms: Washrooms and Change areas	No	Yes	Modified Portland Cement	Epoxy	310F
.4	Walls General	No	No	Modified Portland Cement	Epoxy	303W
.5	Walls Change Rooms: Shower Rooms	Yes	No	Modified Portland Cement	Epoxy	303W
.6	Walls Change Rooms: Washrooms and Change areas	No	No	Modified Portland Cement	Epoxy	310F
.7	Ceilings Change Rooms: Washrooms and Shower Rooms	Yes	No	Modified Portland Cement	Epoxy	315C

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section Includes
  - .1 Acoustical tile ceiling systems (ACT1 and 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.
- .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 shop drawings.
  - .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.
  - .5 Submit engineered shop drawings for structural grid for ACT3, including the following:
    - .1 Description of design criteria.
    - .2 Stress and deflection analysis.
    - .3 Selection of framing members, fittings and accessories.
    - .4 Submit all pertinent manufacturer's published data.
    - .5 Submit coordination drawings indicating locations of concealed grounds, cutout plates and other required fabrications.
    - .6 Show relation to adjoining construction, details of outside and inside corners and door openings.
- .4 Samples:

### Acoustical Tile Ceiling Systems

---

- .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*.
- .6 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, 2% 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*.

## 1.4 Quality Assurance

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 *Provide* work of this section, executed by competent installers with experience 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 10 m<sup>2</sup> (108 ft<sup>2</sup>) in area, complete with perimeter wall trim,. 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*.

## 1.5 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.

## Acoustical Tile Ceiling Systems

---

- .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.

### 1.6 Field Conditions

- .1 Commence installation after building is enclosed with windows and exterior doors in place and glazed, and roof watertight.
- .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-13a deflection test.
- .2 Design suspension system to support safely, and without distortion, the superimposed loads of:
  - .1 Air supply diffusers and return grilles.
  - .2 Lighting fixtures.

### 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 Acoustical panel ceiling systems:
  - .1 Panels: *Provide* panels comprising composite structural fibreglass core with non-woven polyester textile surface wrapped on two opposite edges and matching integral hinged support clip on other two edges; with properties as follows:
    - .1 Thickness: 28.5 mm (1-1/8").
    - .2 Reveal: Panels configured to maintain reveal of 6 mm (1/4") between adjacent panels.
    - .3 NRC: 0.85, measured in accordance with ASTM C423-09a.
    - .4 Surface burning characteristics: Class A Flame Spread 25 or under smoke developed less than 50, to CAN/ULC-S102-10.
    - .5 Moisture Resistance: Resistant to relative humidity up to 95% at 40.5°C for 30 days.
    - .6 Mould and mildew resistant: In accordance with requirements of ASTM C665-12.

Acoustical Tile Ceiling Systems

---

- .7 Fungi resistant: Inc accordance with requirements of ASTM C1338.
- .8 Accessibility:
  - .1 Panels in clipped systems shall be downward accessible by disengaging hinge support rail on one side of panel from the direct mount suspension system mount rail flange without the use of tools. Panel shall swing hinge downward to provide complete access without removal of the panel from the ceiling.
- .9 ACT1:
  - .1 Basis of design:
    - .1 Techstyle E Classic (Lay-in) by Hunter Douglas Architectural Products.
      - .1 Colour: White.
      - .2 Size: 24" x 48".
- .10 ACT2:
  - .1 Basis of design:
    - .1 Techstyle E Clipped by Hunter Douglas Architectural Products.
      - .1 Colour: White.
      - .2 Size: 24" x 96".
- .2 Exterior or wet environment grade suspension system:
  - .1 Interlocking tee system designed to support panels in patterns indicated, consisting of main tees and cross tees. System shall be complete with galvanized double-webbed steel body and aluminum face with stainless steel clips. The system shall provide lock joint intersections of cross and main tees.
  - .2 Acceptable *Products*:
    - .1 Armstrong Prelude 'XL AL 15/16" Exposed Tee'.
      - .1 Colour: WA.
    - .2 CGC 'DX/DXLA' 15/16" exposed tee.
      - .1 Colour: Flat White.
    - .3 Substitutions: in accordance with Section 01 25 00.
- .3 Trim and clips:
  - .1 Basis of design manufacturer: Hunter Douglas.
    - .1 Trims:
      - .1 Provide mitred corners and flush horizontal surfaces.
      - .2 WT1: extruded wall trim.
      - .3 LT: trim at light and mechanical fixtures.
      - .4 Colour: Hunter Douglas standard powder coat white.
      - .5 LX02: floating trim for 'Lay in' Tile.
      - .6 TF2: floating perimeter trim for 'Clipped'.

Acoustical Tile Ceiling Systems

---

.2 Clips:

- .1 TSPC: provide screw clips at cut panel joints.

**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 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-13, ASTM E580/E580M-16, 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-16.
  - .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.
- .3 Do not commence installation until all work above suspended ceiling has been completed, inspected and accepted.

**3.2 Installation - Suspension System**

- .1 Install ceiling panels and metal suspension system in accordance with ASTM E580, ASTM C636/C636M-13, and manufacturer's directions. Where manufacturer's directions are at variance with *Contract Documents*, notify *Consultant* before proceeding with installation.
- .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 instructions.
- .5 Locate hangers at not more than 150 mm (6") from ends of main tee members.
- .6 Install exposed tee members to pattern indicated. Securely attach hangers to main tee members.
- .7 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.
- .8 Space tee bars to suit ceiling panels and as detailed, and to accommodate lighting fixtures, diffusers and return grilles.
- .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 and finish flush with rest of ceiling.

Acoustical Tile Ceiling Systems

---

- .10 Restrict creep inside module panels so that in all cases strips are centred on module lines.
- .11 Install edge moulding as detailed where ceiling abuts vertical surfaces. Lap corners, use maximum lengths to minimize joints. Make joints square, tight and flush.

**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: to ASTM C636/C636M-13.
- .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 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**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Edge grain wood flooring (WDF1).

### **1.2 Administrative Requirements**

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
- .2 Coordination:
  - .1 Coordinate work of this section with the work of Section 06 40 00.

### **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 full size wood samples in the full range of colour for review by *Consultant*. Accepted range shall form standard basis for remainder of installation. Material exceeding range will be rejected.
- .4 Test and evaluation reports:
  - .1 Submit moisture, alkalinity, and adhesive bond test results.

### **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 2% of each type of flooring material required for the *Work* for maintenance use. Store where directed. Clearly identify each box.
  - .2 Maintenance materials to be same production run as installed materials.

### **1.5 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 Provide work of this section, executed by competent installers experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

## Wood Flooring

---

### 1.6 Delivery, Storage, and Handling

- .1 Store materials in area of installation for minimum of 72 hours prior to commencing of work.

### 1.7 Field Conditions

- .1 Install materials of this section only when surfaces and air temperatures have been maintained between 18°C and 32°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.
- .2 Allow wood flooring and adhesive to warm up to room temperature for 24 hours before application.
- .3 Ensure that adequate ventilation is provided during installation and curing of materials of this section.
- .4 Concrete floors are to be dry, and exhibit negative alkalinity, carbonization, or dusting, and be free of curing/sealing compounds, residue from paint and adhesives.
- .5 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.

## PART 2- PRODUCTS

### 2.1 Material

- .1 Edge grain wood flooring:
  - .1 WDF1:
    - .1 Basis of design:
      - .1 Kaswell Flooring Systems 'Edge Grain White Oak Planks'.
        - .1 Length: 160 mm.
        - .2 Width: 8 mm.
        - .3 Thickness: 23 mm.
- .2 Floor finish:
  - .1 Site applied waterbased finish; 4 coats:
    - .1 Basis of design:
      - .1 Sealer: 'Bona DTS' water based sealer, 1 coat.
      - .2 Finish: Bona 'Naturale', 3 coats.
  - .2 White wash oil finish to match control sample.
- .3 Adhesives:
  - .1 Basis of design:
    - .1 Bostik 'Urethane Adhesive'.
  - .2 Acoustic underlayment adhesive: Type as recommended by acoustic underlayment manufacturer and compatible with materials.

## Wood Flooring

---

.4 Anti-slip strips:

- .1 Continuous aluminum trims 4 mm x 15 mm deep to be inset into floor full length of stair.

### 2.2 Fabrication

- .1 Assemble units of specified wood species and patterns.
- .2 Secure individual pieces together in manner which permits ease of handling and secure installation.
- .3 Site rotor nosings and edge details as indicated on Drawings.
- .4 Finish units: fill in gaps, joints and indents; sand surface of blocks; and apply sealer and finishing coats.

## PART 3 - EXECUTION

### 3.1 Examination

- .1 Examine the existing conditions and ensure surface variations do not exceed 3 mm in 3000 mm (1/8" in 9.84').
- .2 Acclimatize materials on site to manufacturer's written instructions.
- .3 Examine substrate surfaces to receive the work of this section and ensure that work done as part of the work of other sections is complete and that there are no conditions which will adversely affect the performance of this work. Notify the *Contractor* of any unsatisfactory conditions. Do not proceed with this work until unsatisfactory conditions have been corrected. Commencement of work of this section implies acceptance of surfaces and conditions.
- .4 Verify that temperature and environmental conditions required by the flooring manufacturer are suitable for installation of materials. Examine substrate for proper dryness in accordance with manufacturer's requirements.
- .5 Do not commence installation until work of other sections that may damage the flooring is complete.

### 3.2 Preparation

- .1 Install flooring in accordance with manufacturer's recommendations.
- .2 Comply with recommendations of ASTM F710-11.
- .3 Alkalinity, moisture, and bond testing:
- .1 Where concrete substrate exhibits higher than permitted moisture and alkalinity levels, *Provide* water vapour reduction system in accordance with Section 01 50 00 and repeat moisture and alkalinity tests.
- .2 Proceed with installation only after substrates pass testing. Document tests performed and submit in writing to *Consultant*.
- .3 Test in accordance with paragraph 3.5 Field Quality Control.

## Wood Flooring

---

### 3.3 Edge Grain Wood Flooring

- .1 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.
- .2 Allow 5 mm (3/16") expansion space at walls or projections in floor area.
- .3 Adhesive application:
  - .1 Apply adhesive over substrate in accordance with manufacturer's instructions.
  - .2 Apply no more adhesive than can be covered with flooring before working time expires.
  - .3 Allow no streaks or lumps in adhesive during application.
  - .4 Remove adhesive that has set or that has formed surface film before flooring is embedded. Apply fresh coat of adhesive.
  - .5 Apply flooring units with uniform pressure but avoid working adhesive into joints.
  - .6 Ensure full adhesion.
  - .7 Remove minimum 6 units before adhesive sets to inspect for complete coverage of adhesive and replace units immediately.
  - .8 Remove excess adhesive from flooring units.
- .4 Install hardwood reducer strips to suit adjacent floor finish.

### 3.4 Finishing

- .1 Sand and prepare wood floor to NOFMA-accepted methods. Use at least three passes, plus screening.
  - .1 1st sanding: 40 grit or lower.
  - .2 2nd sanding: 60 grit.
  - .3 3rd sanding: 80 grit.
  - .4 Screening.
- .2 Apply sealer to manufacturer's printed installation instructions.
- .3 Mix finish system components in accordance with manufacturer's printed directions.
- .4 Apply 3 coats of floor finish to match approved mock-up, at coverage rate as recommended by manufacturer. Do not spread finish too thin.
- .5 Allow floor finish to cure thoroughly before permitting traffic. Abrade floor finish between coats when allowed to cure longer than 48 hours between coats. Abrade prior to final finish coat. Vacuum and tack thoroughly with slightly water-dampened 'Bona Mop' or cloth after abrading.
- .6 Apply floor finishing system to provide a premium quality, smooth and consistent finish free of imperfections, dust or lint particles, and scratches or abrasions.

### **3.5 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00.
  - .1 Field tests and inspections:
    - .1 Conduct the tests in accordance with ASTM F710-11 and the following:
      - .1 Test for moisture vapour transmission in accordance with ASTM F710-11 and ASTM F1869-16 or ASTM F2170-16a in accordance with manufacturer's written flooring installation instructions. 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 F1869-16, or exceed 75% when tested to ASTM F2170-16a.
      - .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 F710-11.
      - .3 For each test type: Conduct 3 tests for flooring applications up to  $93 \text{ m}^2$  (1000 square feet) in area, and 1 additional test for each additional  $93 \text{ m}^2$  (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.
      - .5 Testing shall be completed prior to application of water vapour reduction system, if applicable, and after application of water vapour reduction system in accordance with floor finish specifications.
    - .2 Adhesion bond test:
      - .1 Proceed with bond test after substrates have been prepared and alkalinity and moisture test have been completed.
      - .2 Adhesion bond test shall be completed in accordance with flooring and adhesive setting manufacturer's written instructions.
      - .3 Using the specified adhesive set test wood flooring boards using adhesive manufacturer's recommended trowel.
      - .4 After duration recommended by flooring and adhesive manufacturer, attempt to remove the test wood flooring boards by pulling up from the corners.
      - .5 Independent inspection and testing agency shall determine if the bond is adequate.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Aluminum bases (ALUM).

### **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:
  - .1 305 mm (12") long samples of each colour and type of base material. Include sample of outside corner of base.
- .4 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.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 *Provide* work of this section, executed by competent installers with experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-up:
  - .1 Resilient base mock-up shall include at least one inside corner, one outside corner plus 20 m (65'-0") of straight run.
  - .2 Locate at the *Place of the Work* as part of final installation.
  - .3 Location of installation shall be determined by *Consultant*.

Premanufactured Bases

---

## 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 Ensure 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 Performance/Design Requirements

- .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 Aluminum Base (ALUM)

#### .1 Aluminum materials:

- .1 Aluminum extrusions: Alloy 6063-T5 or T6 to ANSI H35.1/H35.1M-2013.
- .2 Aluminum sheet: aluminum alloy 5005H14 to ANSI H35.1/H35.1M-2013. Exposed sheet shall be machine flattened free of distortions, resquared sawcut edges.
- .3 Aluminum bases:
  - .1 Height: 100 mm (4").
  - .2 Length: 4 m (157-1/2").
  - .3 Acceptable *Products*/manufacturers:
    - .1 Carter Fabricating Inc.
    - .2 Profilitec 'BAS100', clear anodized aluminum, non-self adhesive, where indicated.
    - .3 Profilitec 'Battiscopa Skirting BA-ASN'.
    - .4 Schluter 'DesignBase-SL'.
  - .4 Adhere to substrate with epoxy adhesive suited for aluminum and adjacent substrate finish.
    - .1 Basis of design:
      - .1 Ardex CA 20 Construction Adhesive.

Premanufactured Bases

---

## **2.3 Accessories**

- .1 Block wall filler: Filler type as recommended by resilient base manufacturer to suit substrate and compatible with materials.
- .2 Primers and adhesives: Types as recommended by resilient product manufacturer compatible with materials and to suit substrate types.
- .3 Sealant:
  - .1 Medium-modulus, neutral-curing silicone sealant; complying with ASTM C920-11, Type S, Grade NS.
  - .2 Colour: Clear.
  - .3 Acceptable Manufacturers:
    - .1 Dow Corning.
    - .2 Momentive
    - .3 Tremco,

## **PART 3 - EXECUTION**

### **3.1 Examination**

- .1 Ensure that environmental 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 show 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.

### Premanufactured Bases

---

- .5 Notify *Consultant* of any substrate or levelling compound defects or installation conditions that may result in unsatisfactory performance.
- .6 Alkalinity, moisture, and adhesion bond testing:
  - .1 Perform moisture and alkalinity tests and adhesive bond test.
  - .2 Proceed with installation only after substrates pass testing. Document tests performed and submit in writing to *Consultant*.
- .7 Do not install products until they are same temperature as space where they are to be installed.
  - .1 Move products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
  - .2 Allow coiled resilient material to lay flat for at least 24 hours at 21°C prior to installation.
- .8 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. Do not use sweeping compounds.
- .9 Where flooring adjoins thicker floor materials, apply levelling screed, feather out to make up difference in level between materials.
- .10 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 Installation of Aluminum Base

- .1 Supply and install bases in accordance with manufacturer's instructions and recommendations.
  - .1 Inside and outside corners to be site fabricated.
- .2 Adhere to substrate with epoxy adhesive suited for aluminum and adjacent substrate finish.
  - .1 Apply adhesive for metal bases in accordance with manufacturer's instructions and recommendations.

### 3.4 Installation Tolerances

- .1 Resilient base: Install straight and level to variation of 3 mm (1/8") over 3 m (10'-0").
- .2 Transition trim: Install straight to variation of 3 mm (1/8") over 3 m (10'-0").

### 3.5 Adjusting and Cleaning

- .1 Remove adhesive from surfaces as work progresses in manner described by manufacturer. Remove wet adhesive with a water dampened cloth. If adhesive has dried, use a cloth dampened with mineral spirits.

Premanufactured Bases

---

- .2 Wash surfaces using non-phosphate detergent to remove silicone, wax, dirt and dust using rotary scrubbing machines fitted with nylon brushes. Wash with neutral mild detergent and water, thoroughly buff dry with smooth wool pad. Do not apply any other compounds.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Fluid-applied flooring; EPFC.

### **1.2 Administrative Requirements**

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.

### **1.3 Quality Assurance**

- .1 Qualifications:
  - .1 Manufacturers:
    - .1 Company specializing in manufacturing the *Products* specified in this section, with minimum 10 years experience.
  - .2 Installers / applicators / erectors:
    - .1 Work of this section, executed by competent applicators with minimum 5 years experience 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.

### **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.
- .3 Manufacturers' instructions:
  - .1 Submit substrate preparation guidelines, installation instructions, and general recommendations.

### **1.5 Closeout Submittals**

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:

Fluid-Applied Floor and Wall Coatings

---

- .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

## 1.6 Field Conditions

- .1 Unless required otherwise by manufacturer's installation instruction 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 substrate is sound, dry, free of dust, dirt, paint, grease, oil or other foreign substances that may adversely affect proper adhesion of the coating.
- .3 Ensure that adequate ventilation is provided during installation and curing of materials of this section.
- .4 Protect adjacent surfaces from damage resulting from work of this section.
- .5 Concrete floors and walls are to be dry, and exhibit negative alkalinity, carbonization, or dusting. Maximum percentage of moisture acceptable is 1.8 kg/93 m<sup>2</sup> (4 lb/1000 ft<sup>2</sup>) in a 24 hour period, unless otherwise specified by manufacturer's printed literature.
  - .1 Testing requirements:
    - .1 Test for moisture vapour transmission in accordance with ASTM F1869-16.
    - .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 F710-11.
    - .3 For each test type: Perform 3 tests for flooring applications less than 186 m<sup>2</sup> (2000 square feet) in area, and 1 test per additional 93 m<sup>2</sup> (1000 square feet).
    - .4 Testing shall be by independent inspection and testing company and in accordance with Section 01 45 00.

## 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 Manufacturer

- .1 Specifications are based on *Products* of Sherwin Williams Protective and Marine Coatings. The following listed manufacturers are acceptable only when in compliance with requirements of this section.
  - .1 Sika Canada.
  - .2 Stonhard.
  - .3 Substitutions: in accordance with Section 01 25 00.

Fluid-Applied Floor and Wall Coatings

---

## **2.2 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 Installation of systems specified in this section to be by a single *Subcontractor*.
- .3 Materials shall be sourced from one manufacturer unless otherwise specified.

## **2.3 Fluid-Applied Epoxy Flooring (EPFC)**

- .1 Self-levelling, high solids, chemical resistant, elastomeric epoxy coating.
  - .1 Basis of design:
    - .1 Sherwin Williams 'General Polymers 3555, Ep-Flex HD Epoxy Coating'.
- .2 Patching and levelling compound:
  - .1 Polymer modified, cementitious slurry.
  - .2 Basis of design:
    - .1 Sherwin Williams 'General Polymers TPM-SL'.

## **PART 3- EXECUTION**

### **3.1 Examination**

- .1 Verify that specified environmental conditions are ensured before commencing the work of this section.
- .2 Examine surfaces to receive floor and wall coatings. They shall be smooth, sound, dry, and free from conditions that will adversely affect execution, permanence, or quality of work. Test surfaces for moisture content to ensure that they are suitable for application, and fully cured. Moisture content of concrete shall be checked using a Delmhorst moisture meter. Moisture content shall be within the limits set by the manufacturer prior to commencing work.
- .3 Ensure 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 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.
- .6 Commencement of installation implies acceptance of concrete surface 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.

Fluid-Applied Floor and Wall Coatings

---

- .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 Remove projections and other conditions which may affect installation of the coating.
- .5 Repair surface spalls and imperfections with patching compound approved by manufacturer.

### 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 Apply coating system in compliance with manufacturer's directions to produce a pinhole free surface that also provides a positive slope to drains in flooring system.
- .2 Application; flooring system:
  - .1 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.
  - .2 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.
  - .3 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.
  - .4 Clean surface prior to application of finish coat for approval by *Consultant*.
  - .5 Finish coats: Squeegee apply finish coats over tacky primer at spreading rates as recommended by manufacturer.

### 3.4 Field Quality Control

- .1 Conduct quality control in accordance with Section 01 45 00 and as follows:
  - .1 Verify to Tooke thickness gauge, and in the presence of *Consultant* and manufacturer's representative, that thicknesses of completed floor coatings meet specified requirements.
  - .2 Repair areas as directed by inspection company or *Consultant*, as a result of inspection and testing work.

**END OF SECTION**

Metal Interior Panelling

---

## **PART 1- GENERAL**

### **1.1 Summary**

- .1 Section Includes:
  - .1 Interior prefinished metal (aluminum) wall panels (MWP1).

### **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.
  - .2 Shop drawings shall contain plans, elevations, sections and details for work in this section.
- .4 Samples:
  - .1 Submit duplicate 610 mm x 610 mm (24" x 24") size colour samples of the specified finish for final selection and approval of colour and gloss by the *Consultant*.

### **1.3 Closeout Submittals**

- .1 Operation and maintenance data:
  - .1 Submit manufacturer's cleaning and maintenance instructions for incorporation into operation and maintenance manuals in accordance with Section 01 77 00.

### **1.4 Quality Assurance**

- .1 Mock-up:
  - .1 Before proceeding with final purchase of materials and fabrication of metal wall panel system components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements.
  - .2 Install mock-up at location directed by *Consultant*. Retain accepted mock-up as quality standard for acceptance of completed metal cladding.
  - .3 *Provide* mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and colour.

### **1.5 Delivery, Storage and Handling**

- .1 Store materials at temperatures and in manner recommended by manufacturer.
- .2 Package materials and identify on attached labels the manufacturer, contents and material specification number.

Metal Interior Panelling

---

## PART 2 - PRODUCTS

### 2.1 Materials

- .1 Aluminum sheet; solid type:
  - .1 Aluminum sheet: Aluminum sheet to ASTM B209-14, 0.8 mm (0.032") thick panels in the following alloy:
    - .1 Painting quality: 3003-H14 or 3105-H14 to ANSI H35.1/H35.1M-2013.
  - .2 Profiles to match:
    - .1 Gordon Alpro Pattern C, 2-23/32" x 5/8" perforated and non-perforated, smooth surface.
  - .3 Perforation pattern: 1/8" diameter holes staggered at 21/64" centers, 13% open area.
  - .4 Factory finish:
    - .1 70% Kynar 500 or Hylar 5000 fluoropolymer resin systems, ceramic pigments and other select inorganic pigments to AAMA 2605-13.
      - .1 Acceptable *Products*:
        - .1 PPG 'Duranar XL'.
        - .2 Valspar 'Fluorpon Classic II'.
        - .3 Acrogard-UVX.
      - .2 Colour: White.
- .2 Sub-Girts:
  - .1 Preformed galvanized metal sheet, 1.22 mm (18 gauge) minimum base steel nominal thickness.
  - .2 Adjustable clips: as required to suit *Place of the Work* conditions.
- .3 Accessories and hardware:
  - .1 Zinc coated steel to meet specified requirements of CAN/CSA G164-M92, hot dip galvanized after fabrication.
  - .2 Exposed trim, end and flute closures, cap pieces, flashings, and the like, of same metal material, finish, and colour as prefinished metal panels.
- .4 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.
- .5 Sealants:
  - .1 Sealants and joint backing: in accordance with Section 07 92 00.

## Metal Interior Panelling

---

- .2 Colour shall be selected by the *Consultant* from the standard colour chart. For larger quantities special colours are available.
- .6 Insulation:
  - .1 Surface burning characteristic, in accordance with CAN/ULC-S102-10:
    - .1 Flame Spread Value (FSV): Maximum 25.
    - .2 Smoke Developed Value (SDV): Maximum 50.
  - .2 *Provide* either one of the following, using same *Product* throughout:
    - .1 PVC wrapped fibreglass acoustical pad.
      - .1 Thickness: 50 mm.
    - .2 INS-62:
      - .1 Glass fibre sound attenuation board, black colour. Cut edges shall be concealed and finished to match face of insulation where exposed.
        - .1 Acceptable *Product*:
          - .1 Owens Corning 'SelectSound Black Acoustic Board'.
    - .3 Substitutions: in accordance with Section 01 25 00.

## 2.2 Fabrication

- .1 Form prefinished metal panels to profiles indicated with bends sharp and true.
- .2 Fabricate to conform to requirements of *Contract Documents* and reviewed shop drawings, and to allow for structural movements within the systems.
- .3 Ensure that metal panels are free of steel contamination from rollers.
- .4 Cooperate with applicable sections to ensure coordination required for proper installation of work of this section in conjunction with and incorporated with other work.
- .5 Fabricate metal cladding panels in one length; maximum 6000 mm (20') for horizontal application; 12000 mm (40') for vertical application; unless otherwise indicated.
- .6 Prefinished metal panel terminations shall not have a raw metal edge or exposed fasteners. Panel ends 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 Installation

- .1 Panel system shall be installed in accordance with manufacturer's recommendations.
- .2 Erect panels in straight lines that are true, level, and plumb.

Metal Interior Panelling

---

- .3 Allow for differential thermal and structural movement between systems and structure as well as between elements of system.
- .4 Fasteners: Conceal fasteners.

**3.3 Installation Tolerances**

- .1 Maintain the following installation tolerances:
  - .1 Maximum variation from plane or location shown on reviewed shop drawings: 3 mm per 3 m of length and up to 30 mm per 100 m maximum.
  - .2 Do not exceed 10 mm (3/8") from drawings locations.
  - .3 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 1 mm (0.039").

**3.4 Adjusting and Cleaning**

- .1 Small chips, imperfections, blemishes or other defects may be made good with the approval of the architect.
- .2 Defects shall be repaired with colour matched synthetic enamel and 2-part epoxy where ground coat is breached.
- .3 Upon completion of the work of this section, remove protective covering and paper labels from exposed surfaces, and clean from surfaces smears, dirt and grime with cleaning materials as recommended by the panel supplier.

**END OF SECTION**

## **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 Architectural concrete and pre-cast concrete.
    - .5 Stainless steel, weathering steel, copper, bronze, chromium plate, nickel, anodized or lacquered or mill finished aluminum, Monel metal.
    - .6 Insulation.
    - .7 Glass and plastic.
    - .8 Brick, stone and exterior masonry veneers.
    - .9 Metallic and mastic insulation finishes.
    - .10 Abrasive material finishes on floors, stair treads, stair nosing and landings.
    - .11 Insulated electric cables.
    - .12 Machined parts of machinery and equipment.
    - .13 Concealed surfaces.
    - .14 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 and list of *Products*:
  - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section as identified in 'Approved Product List' section of the MPI Painting Manual. Correlate *Products* to Schedule furnished by *Consultant*.
- .3 Samples and colour:

## Painting

---

- .1 Colours: *Consultant* will furnish paint colour numbers and colour schedule indicating colour locations.
- .2 Samples for initial selection:
  - .1 Submit manufacturer's colour charts showing full range of colour 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 colour in compiling colour schedule and will not necessarily select colour from standard colour charts of manufacturer of *Products* specified.
    - .1 Colour schedule: in accordance with Room Finish Schedule.
  - .3 Submit 3 drawdowns of each selected colour for review by *Consultant* and resubmit to *Consultant* as required to obtain final approval. Drawdown to be of specified colour, sheen, and paint formula for applicable surface.
- .3 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.
- .4 Manufacturer's instructions:
  - .1 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.

### 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 Manufacturer's:

## Painting

---

- .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 of 5 years proven satisfactory painting experience of projects of similar size and class subject to *Consultant's* approval.
- .2 Mock-ups:
  - .1 Provide full finished mock-up installation of each paint colour, for indicated surfaces and mock-up size, showing colour and finish selected by *Consultant*, under lighting conditions matching final area lighting, for acceptance by *Consultant*. Locate at *Place of the Work* as part of finished installation if accepted.
    - .1 Concrete block, concrete and gypsum board: 9.3 m<sup>2</sup> (100 ft<sup>2</sup>).
    - .2 Hollow metal doors and frames: 1 door and frame for each finish specified.
  - .2 Upon completion and approval, sample finishes 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 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.
- .4 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%.
  - .2 Gypsum board and plaster: Maximum 12%.
  - .3 Wood: Maximum 15%.

Painting

---

- .5 Conduct moisture tests on concrete floors using cover patch test method.
- .6 Test concrete, masonry and plaster surfaces for alkalinity.

## **1.8 Extended Warranty**

- .1 Warrant work of this section for a period of 2 years, in accordance with Section 01 78 36.
- .2 Throughout warranty period, painting systems 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.
- .3 Presence of any of following during the warranty period 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.

## **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 Quality standard: 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.

### **2.2 Materials**

- .1 Products listed by the following manufacturers shall be used in the *Work*, unless specified otherwise:
  - .1 Benjamin Moore & Co. Limited.
  - .2 Sherwin-Williams Canada Inc.
  - .3 PPG Industries Architectural Coatings.
  - .4 PPG Architectural Coatings (includes Amercoat, Dulux, and PPG Paints Products).
  - .5 Devoe Industrial Coatings
  - .6 Carboline Company.
  - .7 Substitutions: in accordance with Section 01 25 00.
- .2 Unless specified otherwise, 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.

## Painting

---

- .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: LEED 09 BD&C Building Design and Construction Table 1, IEQc4.2 Applicable VOC Limits:
    - .1 Interior Flat Coating:
      - .1 Reference Standard: Green Seal GS-11, 1993.
      - .2 VOC Limit: 50 gm/L.
    - .2 Interior Non-Flat Coating:
      - .1 Reference Standard: Green Seal GS-11, 1993.
      - .2 VOC Limit: 150 gm/L.
    - .3 Anti-Corrosive / Anti-Rust Paint:
      - .1 Reference Standard: Green Seal GC-03, 1997.
      - .2 VOC Limit: 250 gm/L.
    - .4 Primers, Sealers and Undercoaters:
      - .1 Reference Standard: SCAQMD Rule 1113, 2004.
      - .2 VOC Limit: 200 gm/L.

### 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 instructions.
- .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 Finish and Colours

- .1 Paint finishes shall be as selected by the *Consultant*. Locations as indicated or scheduled.
- .2 Colours: Prior to beginning painting work, *Subcontractor* will be furnished with copy of colour schedule. Colours as selected by *Consultant*.

Painting

## 2.6 Gloss / Sheen Ratings

- .1 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	

- .2 Gloss level ratings of painted surfaces shall be as specified herein and as noted on the Paint Systems and Anti-Corrosion Schedule or Room Finish Schedule.

## 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 pH of surfaces to be painted in accordance with paragraph above titled Environmental Requirements.
- .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.
- .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 instructions 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 and encapsulants.

## Painting

---

- .4 Concrete substrates: Remove release agents, curing compounds, efflorescence, and chalk. Paint surfaces when moisture content or alkalinity of surfaces to be painted are within levels permitted in accordance with manufacturer's written instructions.
- .5 Masonry substrates: Remove efflorescence and chalk. Paint surfaces when moisture content or alkalinity of surfaces or mortar joints are within levels permitted in accordance with manufacturer's written instructions.
- .6 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.
- .7 ZF75 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.
- .8 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.
- .9 Wood substrates for paint finish:
  - .1 Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - .2 Sand surfaces that will be exposed to view, and dust off.
  - .3 Prime edges, ends, faces, undersides, and backsides of wood.
  - .4 After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 Installation

- .1 Do not paint unless substrates are acceptable and/or until environmental 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 environmental 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.

## Painting

---

- .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).
- .11 Exposed means 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.
- .12 *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*.
- .13 Unless otherwise noted or scheduled, walls shall be painted same colour within a given area.
- .14 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 Conduit
  - .3 Diffusers
  - .4 Ductwork
  - .5 Grilles
  - .6 Hangers
  - .7 Heaters
  - .8 Louvres
  - .9 Radiators
  - .10 Stacks
  - .11 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*.

## Painting

---

- .6 Gas pipes, whether concealed or exposed, shall be painted in yellow-orange colour, 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

- .1 *Subcontractor* shall develop and implement a field quality control program in accordance with the MPI manual.
- .2 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.).
- .3 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:
  - .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.
- .4 Painted surfaces rejected by *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.

### 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 Read in conjunction with Section 09 91 01.
- .2 Paint systems are Premium Grade, Low VOC, unless otherwise indicated.
- .3 *Acceptable Products:*
  - .1 As specified herein.
  - .2 Where an MPI system is referenced, but no specific Product is listed, use products listed in the latest edition of the MPI Approved Products List.
  - .3 Concrete vertical surfaces where indicated (including horizontal soffits):
    - .1 EXT 3.1A Latex finish (over alkali resistant primer), eggshell (G3) or flat (G1) where indicated.
  - .4 Concrete horizontal surfaces (decks, stairs, driveways, parking and court areas, etc):
    - .1 EXT 3.2G Clear sealer finish.
    - .2 EXT 3.2H Clear water based sealer finish.
  - .5 Metal fabrications except as specified below in this section:
    - .1 Primer coat: in accordance with Section 05 50 00 and as recommended by paint manufacturer.
    - .2 Top coats: High Performance Acrylic (HP Acrylic), semi-gloss (G5).
      - .1 *Acceptable Products:*
        - .1 Sherwin Williams Sher-Cryl HPA B66-350.
        - .2 Carboline Carbocrylic 3359 DTM.
        - .3 PPG Pitt-Tech Plus 90-1310 Series.
  - .6 Galvanized or Galvanneal exterior steel doors:
    - .1 W.B. Light industrial coating over water based acrylic primer, semi-gloss (G5).
      - .1 *Primer Coat, Acceptable Products:*
        - .1 PPG Devflex 4020PF Direct to Metal Primer.
        - .2 Sherwin Williams Pro-Cryl B66-310 Series Universal Primer.
        - .3 PPG Pitt-Tech Plus 90-912 Series DTM Industrial Primer.
      - .2 *Top coats, Acceptable Products:*
        - .1 PPG Devflex 4206 QD Int. / Ext. Waterborne Semi-gloss Enamel.
        - .2 Sherwin Williams Pro Industrial Acrylic Semi-Gloss B66-650.
        - .3 PPG Pitt-Tech Plus Int./Ext. Semi-Gloss DTM Industrial Enamel 90-1210 Series.

### 3.8 Interior Paint Systems

- .1 Read in conjunction with Section 09 91 01 for locations of systems specified below.

Painting

---

- .2 System references listed are based on MPI Manual and are Premium Grade, Low VOC, unless otherwise indicated.
- .3 Acceptable *Products*:
  - .1 As specified herein.
  - .2 Where an MPI system is referenced, but no specific Product is listed, use products listed in the latest edition of the MPI Approved Products List.
  - .3 HIPAC Latex: High performance architectural latex:
    - .1 Primer Coat: As recommended by top coat manufacturer unless otherwise specified.
    - .2 Top coats (2 coats unless otherwise specified):
      - .1 Benjamin Moore Aura Waterborne Latex K52x series.
      - .2 Sherwin Williams Duration Interior Acrylic Latex A9x-1200 Series.
      - .3 Dulux Diamond 14220/15110 Interior Acrylic.
  - .4 WB Epoxy: Water based (W.B.) light industrial coating:
    - .1 Primer Coat: As recommended by top coat manufacturer unless otherwise specified.
    - .2 Top coats (2 coats unless otherwise specified):
      - .1 Benjamin Moore Corotech Pre-Catalyzed Waterborne Epoxy V341 / V342.
      - .2 Sherwin Williams Pre-Catalyzed Waterbased Epoxy K45 / K46-150 Series.
      - .3 PPG Pitt-Glaze WB1 Interior Pre-Catalyzed Water-Borne Epoxy 16-310 / 16-510.
- .4 Concrete vertical surfaces (including horizontal ceilings and soffits):
  - .1 HIPAC Latex over W.B. alkali-resistant primer.
    - .1 Primer coat (basis of design):
      - .1 Dulux Gripper #60000.
  - .2 WB Epoxy over W.B. alkali-resistant primer.
    - .1 Primer coat (basis of design):
      - .1 Dulux Gripper #60000.
- .5 Concrete masonry units:
  - .1 HIPAC Latex over block filler and W.B. alkali-resistant primer.
  - .2 WB Epoxy over block filler and W.B. alkali-resistant primer.
- .6 Concrete block; stain finish:
  - .1 INT 4.2A Latex finish modified:
    - .1 Omit 1st Coat: Latex Block Filler.
    - .2 Thinned 2nd Coat: Latex (50% water reduced).
    - .3 Thinned 3rd Coat: Latex (50% water reduced).

Painting

---

- .4 Gloss: Semi-Gloss.
- .7 Metal fabrications (steel doors and frames and miscellaneous items including pipes, ducts, equipment and related brackets and supports). Includes factory primed and galvanized or galvalume metal.
  - .1 Primer coat and tie coat: Acrylic DTM Rust Inhibitive Primer.
    - .1 Field applied, factory primed, or unpainted surfaces.
    - .2 Acceptable *Products* as recommended by top coat manufacturer:
      - .1 Sherwin Williams B66W1 or B66W310 DTM Primer.
      - .2 PPG Pitt-Tech 90-712 or 90-912 Series DTM Primer.
  - .2 Top coats:
    - .1 HIPAC Latex.
    - .2 WB Epoxy.
- .8 Sprinkler pipe in areas exposed to high humidity where indicated.
  - .1 HP-Pipe:
    - .1 Preparation and paint systems: in accordance with High Performance Paint Coatings Section 09 96 13.
- .9 Primed Miscellaneous Metals and Architectural Metals supplied by Division 05.
  - .1 Primer: in accordance with Section 05 50 00 and as recommended by top coat manufacturer.
  - .2 Touch up primer and tie coat: 100% Acrylic DTM Rust Inhibitive Primer for Interior or Exterior Surfaces.
    - .1 Field applied as required to repair damage, defects or contamination.
    - .2 Acceptable *Products*:
      - .1 Sherwin Williams B66W1 or B66W310 DTM Primer (spray applied).
      - .2 PPG Pitt-Tech 90-712 or 90-912 Series DTM Primer.
  - .3 Top coats:
    - .1 HIPAC Latex.
    - .2 WB Epoxy.
- .10 Galvanized Miscellaneous Metals and Architectural Metals supplied by Division 05.
  - .1 Primer coat: 100% Acrylic DTM Rust Inhibitive Primer for Interior or Exterior Surfaces.
    - .1 Acceptable *Products*:
      - .1 Sherwin Williams B71Y1 DTM Wash Primer.
      - .2 Carbolite Sanitile 120 Heavy Duty Bonding Primer.
      - .3 PPG Pitt-Tech 90-712 Series DTM Primer.
  - .2 Top coats:

Painting

---

- .1 HIPAC Latex.
- .2 WB Epoxy.
- .11 Dressed lumber: (including doors, door and window frames, casings, mouldings, etc.)
  - .1 HIPAC Latex over latex primer.
    - .1 Primer coat (basis of design):
      - .1 PPG Dulux Gripper #60000.
    - .2 INT 6.3E Polyurethane varnish finish (over stain); semi-gloss.
    - .3 INT 6.3K Polyurethane varnish finish; semi-gloss.
- .12 Wood doors, painted:
  - .1 Aggressive environments:
    - .1 INT 6.3L Epoxy; semi-gloss.
      - .1 Acceptable *Products*:
        - .1 Benjamin Moore, Corotech, Polyamide Epoxy.
        - .2 Sherwin Williams, Protective & Marine, Macropoxy 646 Fast Cure Epoxy.
  - .2 Normal environments:
    - .1 INT 6.3A High performance architectural latex over latex primer; semi-gloss.
      - .1 Acceptable *Products*:
        - .1 Benjamin Moore, Aura, Waterborne Interior.
        - .2 PPG Architectural, Dulux Diamond (CA), Interior 100 percent Acrylic Latex.
        - .3 Sherwin-Williams, Pro Industrial, Pre-Catalyzed Waterbased Epoxy.
- .13 For wood in pool area including decking and solid wood at pool interior:
  - .1 Coordinate with Section 06 18 00.
  - .2 Basis of design:
    - .1 Two coats of 'Sansin SDF' plus one coat of Sansin 'SDF TopCoat' as distributed by The Sansin Corporation.
  - .3 Color: to later selection by *Consultant*.
- .14 Plaster and gypsum board:
  - .1 HIPAC Latex over latex primer sealer.
    - .1 Primer coat (basis of design):
      - .1 Dulux X-pert #11000 or Dulux Ultra Zero VOC #97600.
  - .2 WB Epoxy over latex primer sealer.
    - .1 Primer coat (basis of design):
      - .1 Dulux X-pert #11000 or Dulux Ultra Zero VOC #97600.

Painting

---

- .3 Vinyl-acrylic primer-surfacer at locations scheduled to receive a level 5 gypsum panel finish and at glass mat faced gypsum board.
  - .1 Basis of design:
    - .1 PPG Dulux High-build Interior Latex Primer/Sealer #11010 or PPG Speedhide MaxBuild High Build Drywall Surfacers #6-1.
- .15 Cement board horizontal assembly in Aquatic Hall, where indicated:
  - .1 2 coats, elastomeric coating; flat.
  - .2 Basis of design:
    - .1 PPG Perma-Crete Pitt-Flex Elastomeric Coating – Smooth.
    - .2 Substitutions: in accordance with Section 01 25 00.

**3.9 Interior and Exterior Structural Steel Anti-Corrosion and Paint Systems**

- .1 Read in conjunction with Section 09 91 01 and 09 96 13.
- .2 Coordinate steel preparation and shop priming with requirements in Structural documents.
- .3 Steel ST-1. Black steel, unpainted.
  - .1 Preparation: SSPC SP2, Hand Tool Cleaning.
  - .2 No painting is required for this steel type.
- .4 Steel ST-2. Primed steel, nominal grade:
  - .1 Preparation: SSPC SP2, Hand Tool Cleaning.
  - .2 Primer:
    - .1 Scope: One coat, shop applied in accordance with CISC/CPMA 2-75.
    - .2 General description: Universal Phenolic Alkyd Primer.
    - .3 Acceptable *Products*:
      - .1 PPG Devguard 4360 Low VOC Universal Primer.
      - .2 Sherwin Williams B50 Kem Bond HS Universal Metal Primer.
      - .3 PPG Amercoat 185H Universal Phenolic Primer.
- .5 Steel ST-3. Reserved.
- .6 Steel ST-4. Painted steel, premium grade:
  - .1 Preparation: SSPC SP6, Commercial Blast Cleaning.
  - .2 Primer coat:
    - .1 Scope: One coat, shop applied in accordance with CISC/CPMA 2-75.
    - .2 General description: Universal Phenolic Alkyd Primer.
    - .3 Acceptable *Products*:
      - .1 PPG Devguard 4360 Low VOC Universal Primer.
      - .2 Sherwin Williams B50 Kem Bond HS Universal Metal Primer.

Painting

---

- .3 PPG Amercoat 185H Universal Phenolic Primer.
- .3 Touch-up primer:
  - .1 Scope: Field applied as required to repair damage, defects or contamination.
  - .2 General description: Water Based Acrylic Primer.
  - .3 Acceptable *Products*:
    - .1 PPG Devflex 4020PF Direct to Metal Primer.
    - .2 Sherwin Williams B66W1 DTM Acrylic Primer/Finish.or Pro-Cryl B66-310 Series Universal Primer.
    - .3 PPG Pitt-Tech Plus 90-712 DTM Primer/Finish or 90-912 Series DTM Industrial Primer.
- .4 Top coats:
  - .1 Scope: Two coats (minimum), site applied.
  - .2 Unless otherwise specified apply top coats to match adjacent substrate.
  - .3 Products as listed in Interior Paint Systems above:
    - .1 High performance architectural latex (HIPAC Latex).
    - .2 W.B. light industrial coating (WB Epoxy).
- .7 Steel ST-5A and 5B. Primed and painted steel, high performance system.
  - .1 Preparation and Paint systems: in accordance with High Performance Paint Coatings Section 09 96 13.
- .8 Steel ST-6. Reserved.
- .9 Steel ST-7. Galvanized steel, minor elements, primed and painted.
  - .1 Galvanizing in accordance with Division 05.
  - .2 Preparation: SSPC SP1, Solvent Cleaning.
    - .1 Hydrocarbon solvents are not permitted.
  - .3 Primer coat:
    - .1 Scope: One coat, site applied.
    - .2 General description: 100% Acrylic DTM Rust Inhibitive Primer for Interior or Exterior Surfaces.
    - .3 Acceptable *Products*:
      - .1 Sherwin Williams B71Y1 DTM Wash Primer.
      - .2 Carboline Sanitile 120 Heavy Duty Bonding Primer.
      - .3 PPG Pitt-Tech 90-712 Series DTM Primer.
  - .4 Top coats:
    - .1 Scope: Two coats (minimum), site applied.
    - .2 General description: Water Based DTM 100% Acrylic Interior/Exterior Paint Finish, Gloss (G6).

Painting

---

- .3 *Acceptable Products:*
  - .1 Sherwin Williams Sher-Cryl HPA B66-300.
  - .2 Carboline Carbocrylic 3359 DTM.
  - .3 PPG Pitt-Tech Plus 90-1310 Series.
- .10 Steel ST-8. Galvanized steel, major elements, primed and painted, high performance system.
  - .1 Galvanizing in accordance with Division 05.
  - .2 Preparation and Paint systems: in accordance with High Performance Paint Coatings Section 09 96 13.
- .11 Steel ST-9. Reserved.
- .12 Steel ST-10. Reserved.
- .13 Steel ST-11. Reserved.
- .14 Steel ST-12. Metal deck, galvanized coating, unpainted.
  - .1 Galvanized coating in accordance with Division 05.
  - .2 No painting is required for this steel type.
- .15 Steel ST-13.
  - .1 Galvanized coating in accordance with Division 05.
  - .2 Preparation and Paint systems: in accordance with High Performance Paint Coatings Section 09 96 13.

**END OF SECTION**

Paint Systems and Anti-Corrosion Schedule

**PART 1 – GENERAL**

**1.1 General Notes**

- .1 Read in conjunction with Section 09 91 00 – Painting and Section 09 96 13 – High Performance Paint Coatings.

**1.2 Paint Systems: Locations Schedule**

System Abbreviations:	
HIPAC Latex (G#):	High performance architectural latex (Gloss Level)
HP Acrylic	High performance acrylic (Gloss Level)
WB Epoxy (G#):	W.B. Industrial coating (Gloss Level)
<b>Locations</b>	<b>Paint system.</b> <b>See 09 91 00 for description of paintable vs. non-paintable surfaces.</b>
<b>Interiors</b>	
<b>General Public Areas</b>	
Walls	HIPAC Latex (G3)
Ceilings	HIPAC Latex (G1)
Steel Doors and Frames (interior)	HIPAC Latex (G5)
<b>Washrooms and Shower Rooms</b>	
Walls	WB Epoxy (G3)
Ceilings	WB Epoxy (G3)
Steel Doors and Frames (interior)	WB Epoxy (G5)
<b>Aquatic Hall</b>	
Walls	HIPAC Latex (G3)
Ceilings	HIPAC Latex (G1)
Steel Doors and Frames (interior)	WB Epoxy (G5)
<b>Change Rooms</b>	
Walls	WB Epoxy (G3)
Ceilings	WB Epoxy (G3)
Steel Doors and Frames (interior)	WB Epoxy (G5)
<b>Pool Filtration Rooms</b>	
Walls	WB Epoxy (G3)
Steel Doors and Frames (interior)	WB Epoxy (G5)
<b>Service, Janitor, Laundry and Storage Rooms</b>	
Walls	WB Epoxy (G3)
Ceilings	WB Epoxy (G3)
Steel Doors and Frames (interior)	WB Epoxy (G5)
<b>Exit Stairwells</b>	
Walls	HIPAC Latex (G3)
Ceilings	HIPAC Latex (G3)
Steel Doors and Frames (interior)	HIPAC Latex (G5)
<b>Metal and Galvanized Metal Fabrications</b>	
Steel Doors and Frames (interior)	As noted above
Steel Doors and Frames (exterior including inside face and frame)	WB Light industrial coating over water based acrylic primer (G5).
Pipes, ducts, and equipment including brackets and supports.	Primer: Field applied. Top coats: Match system and gloss of adjacent wall or ceiling finish.
<b>Exposed sprinkler pipes in areas subject to high humidity.</b>	
Pool Service Rooms including Mechanical and Filtration Rooms	Galvanized pipe. No paint finish required.
Aquatic Hall	Galvanized pipe. <ul style="list-style-type: none"> <li>Concealed locations: No paint finish required.</li> <li>Exposed locations: High Performance Paint System HP-Pipe.</li> </ul>

Paint Systems and Anti-Corrosion Schedule

<b>Miscellaneous Metal Fabrications</b>	
General	Reference: 05 50 00 Metal Fabrications 05 50 01 Metal Fabrications Schedule.
Exterior galvanized metals	Primer: field applied unless noted otherwise. Top coats: field applied HP Acrylic (G5) unless noted otherwise.
Interior galvanized metals	Primer: field applied unless noted otherwise. Top coats: field applied WB Epoxy (G5) unless noted otherwise.
Interior primed metals	Primer: shop applied unless noted otherwise. Touch up primer and tie coat: field applied. Top coats: field applied WB Epoxy (G5) unless noted otherwise.

### 1.3 Structural Steel Paint System and Anti-Corrosion Schedule

<p>Related Sections:</p> <p>Structural Steel                      05 12 00</p> <p>Metal Deck                            05 31 00</p> <p>High Performance Paint Coatings 09 96 13</p> <p>Definitions:</p> <p>Concealed: Concealed from view in the finished building.</p> <p>Exposed: Exposed to view in the finished building.</p> <p>Unfinished (UNFIN): No field applied topcoat. Reference Room Finish Schedule.</p>		
<b>System</b>	<b>Structural Substrate and System Description</b>	<b>Locations required</b>
ST-1	Black Steel, unpainted.	<b>Interior Structural Steel which is to be encased in concrete.</b>
ST-2	Primed steel, nominal grade.	<b>Interior Structural Steel:</b> Concealed locations: <ul style="list-style-type: none"> <li>Overhead structure in ceiling spaces.</li> </ul>
ST-3	Reserved	
ST-4	Primed and painted steel. Premium grade.	<b>Interior Structural Steel:</b> Exposed locations: <ul style="list-style-type: none"> <li>General locations, except those required to be fire rated.</li> </ul>
ST-5A	Primed and painted steel. High performance system. Section 09 96 13.	<b>Interior Structural Steel:</b> Concealed locations in the following rooms: <ul style="list-style-type: none"> <li>Aquatic Hall (including concealed steel along gridlines A, G, 4, 7, and 9).</li> </ul>
ST-5B	Primed and painted steel. High performance system. Section 09 96 13.	<b>Interior Structural Steel:</b> Exposed and partially exposed locations in the following rooms: <ul style="list-style-type: none"> <li>Aquatic Hall.</li> <li>Pool Storage Room.</li> <li>Mechanical Room.</li> </ul>
ST-6	Reserved.	
ST-7	Galvanized steel, minor elements, primed and painted.	<b>Interior Structural Steel exposed to moisture or high humidity:</b> Exposed locations where structure is indicated to be galvanized and painted. <ul style="list-style-type: none"> <li>Minor elements</li> </ul> <b>Exterior Structural Steel:</b> Exposed locations:

Paint Systems and Anti-Corrosion Schedule

		<ul style="list-style-type: none"> <li>Structural steel, fully or partially outside of the building envelope, including but not limited to the following:               <ul style="list-style-type: none"> <li>Lintels</li> <li>Shelf angles</li> </ul> </li> </ul>
ST-8	Galvanized steel, primed and painted.	<b>Interior Structural Steel:</b> Exposed locations: <ul style="list-style-type: none"> <li>Waterslide support structure. Coordinate with Section 13 14 13.</li> </ul>
ST-9	Reserved	
ST-10	Reserved	
ST-11	Reserved	
ST-12	Metal deck, galvanized (Z275) coating, unpainted.	<b>Interior Metal Deck :</b> Concealed locations.
ST-13FD	Metal deck, galvanized (Z275). High performance system. Section 09 96 13.	<b>Interior Metal Deck :</b> Exposed and partially exposed locations in the following rooms: <ul style="list-style-type: none"> <li>Pool Storage Room.</li> <li>Mechanical Room.</li> </ul>

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

#### **.1 Section Includes**

- .1 Shop and site applied high performance paint coatings for:
  - .1 Exposed steel.
  - .2 Concealed steel.

### **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 *Product* data:
  - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
  - .2 Submit manufacturers' installation instructions.
- .4 Samples:
  - .1 Samples for initial 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.
      - .1 Colour schedule: in accordance with Section 09 91 00.
    - .3 *Contractor* to provide 3 drawdowns of each selected colour for review by *Consultant*. *Contractor* to resubmit as required. Drawdown to be of specified colour, sheen, and paint formula for applicable surface.
  - .2 Samples for verification:
    - .1 Submit samples of various finishes for *Consultant's* approval, at least 30 days before materials are required.
    - .2 Submit three 305 mm x 305 mm (12" x 12") samples of finished metal substrates with each type of specified system for review of colour and gloss by the *Consultant*.

### High Performance Paint Coatings

---

- .3 Where possible identify each sample as to *Project*, finish, formula, colour name, number, sheen name and gloss values, date and name of *Contractor* and painting *Subcontractor*.
- .4 Resubmit as required until colours and gloss value are approved.
- .5 Colours:
  - .1 Prior to beginning painting work, *Contractor* will be furnished with paint colour numbers and copies of colour schedule for surfaces to be painted. Colours will be selected by the *Consultant*.

#### 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 Qualifications
  - .1 Installers / applicators / erectors:
    - .1 Work of this section, executed by competent applicators with minimum 5 years experience in application of *Products* and systems specified and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
  - .1 Provide full finished mock-up installation of each paint colour, for indicated surfaces and mock-up size, showing colour and finish selected by *Consultant*, under lighting conditions matching final area lighting, for acceptance by *Consultant*. Locate at the *Place of the Work* as part of finished installation if accepted.
  - .2 Upon completion and approval, sample finishes shall serve as a standard for the balance of the work of this section. Subsequent work carried out and not in the *Consultant* opinion equal to the standard shall be repainted without charge.

#### 1.6 Field Conditions

- .1 Work of this section shall only be undertaken in environmental conditions as recommended by the paint system manufacturer and as follows:
  - .1 Painting/coating application shall not be proceed unless the substrate temperature is 3°C above the dew point and rising.
  - .2 Unless stated otherwise on manufacturer's technical data sheets temperature shall be greater than 10°C for minimum 24 hours prior to application, during application, and for a minimum of 24 hours after application.
- .2 Make thorough examination of the complete *Contract Documents* to determine intent, extent, materials, types of surfaces, and locations requiring painting and be fully cognizant of requirements.

High Performance Paint Coatings

---

**1.7 Extended Warranty**

- .1 Warrant work of this section for a period of 5 years, in accordance with Section 01 78 36.
- .2 Presence of any of following during the warranty period shall constitute failure: visible corrosion; film peeling, blistering, checking, scaling, embrittling or general film disintegration; and poor adhesion. Adhesion to be tested as per ASTM D3274-09(2013) Method A.

**PART 2 - PRODUCTS**

**2.1 Materials**

- .1 Single source responsibility: Paints and industrial coatings shall be from one manufacturer.
- .2 Primer coats:
  - .1 Structural steel and steel fabrications:
    - .1 General description: Organic Zinc Rich Epoxy.
    - .2 Salt spray resistance: Excellent in accordance with ASTM B117-16, minimum of 80% zinc in the dry film.
    - .3 Direct impact resistance: Good in accordance with ASTM D2794-93 (2010).
    - .4 Humidity resistance: Excellent in accordance with ASTM D4585-07.
    - .5 Water immersion: Excellent in accordance with ASTM D1308-02(2013).
    - .6 Hardness: 6H in accordance with ASTM D3363-05(2012)e2, 7 day cure @ 25°C.
    - .7 Film thickness: DFT of 3.0- 4.0 mils (75-100 Microns) in accordance with SSPC-PA2.
    - .8 Basis of design:
      - .1 Sherwin Williams 'Zinc Clad III Organic Zinc Rich Primer'.
      - .2 Carboline-Carbozinc 859 Organic Zinc Rich Primer.
      - .3 PPG/Ameron – Amercoat 68HS Organic Zinc Rich Primer.
      - .4 Substitutions: in accordance with Section 01 25 00.
  - .2 Galvanized steel:
    - .1 General description: Polyamide Rust Inhibitive, High Performance low VOC epoxy
    - .2 No recoat window issues, unlimited recoat.
    - .3 Superior bond to galvanized and aluminum substrates.
    - .4 Compatible with all topcoats, including hot solvents.
    - .5 VOC limits: <250 g/L.
    - .6 Film thickness: DFT of 5.0 – 10.0 mils (125-250 Microns) in accordance with SSPC-PA2.
    - .7 Basis of design:

High Performance Paint Coatings

---

- .1 Carboline 'Carboguard 893 SG'.
  - .2 Sherwin Williams 'Macropoxy 646-100'.
  - .3 PPG 'Aquapon 98-46'.
  - .4 Substitutions: in accordance with Section 01 25 00.
- .3 Intermediate coats:
  - .1 General description: Polyamide Rust Inhibitive, High Performance low VOC Epoxy.
    - .1 No recoat limitations (unlimited recoat).
    - .2 Chemical Resistant.
    - .3 Low odour, quick dry.
    - .4 Excellent Hardness.
    - .5 Basis of design:
      - .1 Sherwin Williams Macropoxy 646-100. Film thickness: DFT to be 5.0 – 10.0 mils (125 – 250 Microns) in accordance with SSPC-PA.
      - .1 Carboline 553 Waterbourne Epoxy Primer. Film thickness: DFT to be 3.0 – 4.0 mils (75 – 100 Microns) in accordance with SSPC-PA.
      - .2 Substitutions: in accordance with Section 01 25 00.
  - .2 General description: Two component, engineered siloxane coating.
    - .1 Mass density: 1.4 kg/L.
    - .2 Volume solids: 90 ± 2%.
    - .3 Film thickness: DFT 3.0 – 7.0 mils.
    - .4 Basis of design:
      - .1 PPG 'PSX 700'.
      - .2 Substitutions: in accordance with Section 01 25 00.
- .4 Finish coats:
  - .1 General description: Two Component Water-Based Urethane.
  - .2 Highly Flexible, non yellowing stain and chemical resistant
  - .3 Gloss finish.
  - .4 VOC limits to meet LEED requirements for protection of steel from corrosion: <250 g/L.
  - .5 Film thickness: DFT 2.0-3.0 Mils (50- 75 Microns) in accordance with SSPC-PA2.
  - .6 Basis of design:
    - .1 Sherwin Williams – Water- Based Acrolon 100 B65 Series Water-Based Urethane Gloss.
    - .1 Carboline- 134 WB Water-Based Urethane Gloss.
    - .2 PPG 'PSX-800-805.

High Performance Paint Coatings

---

- .3 Substitutions: in accordance with Section 01 25 00.
- .7 General description: Two component, engineered siloxane coating.
  - .1 Mass density: 1.4 kg/L.
  - .2 Volume solids: 90 ± 2%.
  - .3 Film thickness: DFT 3.0 – 7.0 mils.
  - .4 VOC limits to meet LEED requirements for protection of steel from corrosion: <250 g/L.
  - .5 Basis of design:
    - .1 PPG 'PSX-800/805 touch-up.
    - .2 Substitutions: in accordance with Section 01 25 00.

### **PART 3 - EXECUTION**

#### **3.1 Examination**

- .1 Prior to commencement of work of this section, thoroughly examine surfaces scheduled to be painted. Third Party NACE Inspector should be present to examine surfaces prior to commencement of painting.
- .2 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.
- .3 Examine galvanised steel with *Consultant* after shop fabrication is complete but prior to shop finishing. If galvanized finish is deemed acceptable, then application may commence.
- .4 Remove dust, grease, rust, scale and extraneous matter, tool and machine marks and insects from all surfaces which could be detrimental to a satisfactory and acceptable finish.
- .5 Proceed with work only when surfaces and conditions are satisfactory after approval by NACE Coating Inspector.

#### **3.2 Preparation**

- .1 Prepare surfaces to receive high performance coatings in accordance with coating system manufacturer's instructions and recommendations and as follows:
  - .1 Structural steel and steel fabrications (not galvanized):
    - .1 Clean structural steel in accordance with SSPC-SP6 – Commercial Grade Blast Cleaning.
  - .2 Galvanized steel, shop preparation:
    - .1 Clean galvanized steel in accordance with SSPC-SP16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel.

High Performance Paint Coatings

---

- .3 Galvanized steel, minor elements, non-passivated, field preparation:
  - .1 Clean and prepare surface per SSPC using a non-hydrocarbon solvent/degreaser. Galvanized steel that has not weathered for a minimum of 6 months shall be abraded sufficiently by mechanical methods or by brush off blasting to SSPC-SP16 prior to application of primer.
- .4 Galvanized deck, field preparation:
  - .1 Clean and prepare surface per SSPC using a non-hydrocarbon solvent/degreaser. Galvanized steel that has not weathered for a minimum of 6 months shall be abraded sufficiently by mechanical methods or by brush off blasting to SSPC-SP16 prior to application of primer.

### 3.3 Installation

- .1 Apply to surfaces indicated or scheduled to be finished with high performance paint coatings and as noted in high performance paint coating system schedule at the end of this section.
- .2 Apply materials in accordance with manufacturer's printed instructions and recommendations, including recommendations for brushes, rollers, and spray equipment and pressures, and recommendations and directions for mixing multi-component *Products*.
- .3 Apply primers for structural steel and steel fabrications (not galvanized) within 4 hours following cleaning.
- .4 Paint and coating finishes shall be free of defects in materials and workmanship affecting appearance and performance. Defects shall include but not be limited to improper cleaning and preparation of surfaces, entrapped dust and dirt, alligators, blisters, peeling, drips, runs, uneven coverage, misses, poor cutting in, improper use or application of materials.
- .5 Paint shall be applied by means of brushes, rollers, or spray application.
- .6 *Consultant* shall have the right to prohibit the use of spray painting for such reasons during application as carelessness, poor masking or protective measures, drifting paint fog, disturbance to other trades or failure to obtain a dense even opaque finish.
- .7 Apply coats only when the previous coat is dry/cured, in accordance with manufacturer's printed installation instructions and within maximum re-coat windows. If the re-coat window is exceeded the surface must be abraded sufficiently to provide an anchor pattern for re-coating.
- .8 Apply materials evenly, in full coats free from brush and roller marks, sags, runs, crawls, ridges, and other defects. Completed paint or coating shall be uniform in finish, sheen, colour, and texture.
- .9 Areas exhibiting incomplete or unsatisfactory coverage shall have the entire plane painted. Where cutting and patching work has been performed, shall have the entire plane painted. Patching will not be acceptable.
- .10 Permit paint to dry before applying succeeding coats, touch up suction spots and prepare previous coats in accordance with manufacturer's printed instructions. Remove dust of sanding.

High Performance Paint Coatings

---

- .11 Arrange to have traffic barred from completed areas wherever possible or provide adequate protection to prevent contamination of paints or coatings with foreign substances.
- .12 Thicknesses indicated or specified are the minimum required. Apply greater thicknesses until complete uniform coverage is achieved to suit paint products and colours with the exception of Zinc Rich Primers, Zinc Rich primers shall be applied within the limits of coating thicknesses as provided on manufacturer's technical data sheets.
- .13 Do not apply paints and coating over fire rating labels.
- .14 Do not apply paints and coatings over identification labels on mechanical and electrical equipment.

### 3.4 Field Quality Control

- .1 Field quality control shall be in accordance with Section 01 45 00, as supplemented herein.
  - .1 Dry Film Measurements shall be recorded as per SSPC-PA2 Standards using Type II Magnetic Gauges such as Positector 6000 or equivalent. Type II Magnetic gauges shall be in good working order with a valid calibration certificate and shall be zeroed and verified to the surface to be measured or on a zeroing plate provided by the inspector before every inspection. The *Contractor* shall supply the NACE Inspector a zeroing plate (minimum 150 mm x 150 mm (6"x6")) blasted using the same blast media they are using to blast the steel for the work of this section and with a similar blast profile as the end result of the blasted steel.
  - .2 Adhesion testing: *Consultant* may require adhesion testing. If required *Contractor* shall perform adhesion testing in accordance with ASTM D3359-09e2 (Test Method A).
  - .3 The *Contractor* shall have an in shop & field Quality Control ("QC") program in place with personnel trained to keep accurate QC records of all operations. QC records will include the following:
    - .1 Environmental record keeping a minimum of 4 times daily with the first readings being taken before any paint applications proceed using a certified traceable electronic Dew Point meter or Sling Psychrometer that records Ambient Air Temperature, Surface Temperature, Relative Humidity and Dew Point Temperature.
    - .2 Record product names & batch numbers of materials used for the work of this section.
    - .3 Perform wet film thickness gauge and record measurements.
    - .4 Perform QC checks of DFT measurements to verify compliance to specification.
    - .5 Record abrasive types and sizes used for the work of this section.
    - .6 QC documents shall be made available for review and verification by the Third Party NACE Coating Inspector on a weekly basis. QC documents require sign off by a NACE Certified Level 3 Coating Inspector. QC Documents will be neat and in good order with legible details.

High Performance Paint Coatings

---

- .4 Site painted structural steel shall be independently inspected by NACE inspector in accordance with Section 01 45 00.
  - .1 NACE Inspector shall attend the pre-installation meeting to establish preparation and application criteria.
  - .2 Notify NACE Inspector when painting work will be in progress. Site and shop surface preparation and coating/paint applications shall be inspected by a Minimum NACE Certified Level 1 Coating Inspector in good standing. Inspection reports and proceedings will be verified and signed off (sealed) by a NACE Certified Level 3 Coating Inspector in good standing.
  - .3 Leave paint and coating containers at the Place of the Project until examined by NACE Inspector, and remove when directed by *Consultant*.
  - .4 Complete and submit to *Consultant* and NACE inspector at least 4 weeks prior to commencement of painting and coating work, a 'Request for Assignment of Inspector' and 'List of Paint Products'.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00 supplemented as follows:
  - .1 The manufacturer's representative shall perform several reviews during and after coating application at key hold points as follows:
    - .1 Pre-installation meeting: Manufacturer's representative shall meet with metal fabricator, structural steel fabricator, steel deck fabricator, and/or paint contractor to provide surface preparation and coating system recommendations.
    - .2 Surface Preparation: Manufacturer's representative shall review surfaces to be painted and notify fabricator, *Consultant*, and *Owner* of any deficiencies that could adversely affect coating system performance.
    - .3 Paint Application: Manufacturer's representative shall monitor application of a representative sample of first and subsequent coats and notify fabricator, *Consultant*, and *Owner* of any deficiencies that could adversely affect coating system performance.

### 3.5 Adjusting and Cleaning

- .1 Promptly as the work proceeds and on completion of the 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.
- .2 Use paint system manufacturer's recommended cleaning materials and methods.
- .3 Painted steel that has been stored on site shall be cleaned using power washing with 1200 psi power washer prior to application of subsequent coats of touch ups.
- .4 Paint coatings that have exceeded the maximum recoat window shall be abraded sufficiently as deemed by the Third Party NACE Coating Inspector before subsequent coats are applied.

## High Performance Paint Coatings

### 3.6 Protection

- .1 Protect prefinished steel sheet during fabrication, transportation, site storage and installation in accordance with CSSBI Bulletin No. 9.
- .2 Handle and protect galvanized materials from damage to zinc coating. During storage space surfaces of galvanized materials to permit free circulation of air.
- .3 Protect steel painted with specified zinc rich primer from damage during storage, transportation and erection. Upon completion of erection. Areas damaged to be sanded and touched up with the specified epoxy coating in the field order to maintain specified thickness and a consistent finish following procedures recommended in writing by the paint system manufacturer. Painted material that is stored on site must be clean, dry, free of oil, grease, dirt, dust, and foreign contaminants.
- .4 Do not use marking paint, crayons or other marking materials on exposed surfaces.

### 3.7 High Performance Paint Coating System Schedule

- .1 Shop primed systems.

System	Description	SSPC	Primer Shop applied	Intermediate Shop applied	Finish Field applied
ST-5A	<b>Primed and painted steel. Concealed.</b>	SP6	Carboline Carbozinc 859	Carboline 553 WB Epoxy	
			PPG Amercoat 68HS	PPG PSX-700	
			Sherwin Williams Zinc Clad III	Sherwin Williams Macropoxy 646-100	
ST-5B	<b>Primed and painted steel. Exposed.</b>	SP6	Carboline Carbozinc 859	Carboline 553 WB Epoxy	Carboline 134 WB Urethane
			PPG Amercoat 68HS	PPG PSX-700	PPG PSX-700
			Sherwin Williams Zinc Clad III	Sherwin Williams Macropoxy 646-100	Sherwin Williams Acrolon 100 B65

- .2 Field primed systems.

System	Description	SSPC	Primer Field applied	Intermediate Field applied	Finish Field applied
ST-13FD	<b>Galvanized steel deck, primed and painted.</b>	SP16	Carboline Carboguard 893 SG		Carboline 134 WB Urethane
			Sherwin Williams Macropoxy 646-100		Sherwin Williams Acrolon 100 B65
			PPG Aquapon 98-46	PPG PSX-700	PPG PSX-700 touch-up
HP-Pipe	<b>Galvanized pipe, field primed and painted. Exposed.</b>	SP1	Sherwin Williams Macropoxy 646-100		Sherwin Williams Acrolon 100 B65
			PPG Aquapon 98-46		PPG PSX-700

**END OF SECTION**

Signage

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Signage.
  - .2 Concrete, metal fabrications/miscellaneous metals, and lighting for exterior signs.

### **1.2 Administrative Requirements**

- .1 Coordination:
  - .1 Coordinate with other work for satisfactory and expeditious completion of the work of this section.
  - .2 Where signage is to be fitted to other construction, check actual dimension of other construction by accurate field measurements before manufacturing signage; 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 Coordinate with partition accessories, electrical, communications, and finish components to ensure that proper provisions are made for the installation of the work of this section and for work by others.
  - .5 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.
  - .6 Conduct a pre-fabrication meeting in accordance with Section 01 31 19.
  - .7 Conduct a site walk through with the Consultant to review mounting locations and details prior to fabrication.
- .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 for each type of *Product* and process proposed for use in the work of this section including:
    - .1 Preparation instructions and recommendations.
    - .2 Storage and handling requirements and recommendations.
    - .3 Installation methods.
- .3 Shop drawings:
  - .1 Submit engineered shop drawings.
  - .2 Submit shop drawings for each sign type including:

## Signage

---

- .1 Detail drawings showing sizes, lettering and graphics, construction details of each type of sign and mounting details with appropriate fasteners for specific project substrates.
- .2 Materials, thicknesses and their characteristics and finishes.
- .3 Submit coordination drawings indicating locations of concealed grounds, cut-outs, plates, and other required fabrications.
- .4 Show relation to adjoining construction, details of outside and inside corners and door openings.
- .5 Submit a signage schedule indicating signage locations, text and sign types.
- .6 Illuminated signage, include the following:
  - .1 Internal arrangement of electrical components within the sign body, wiring diagrams, and accessories.
  - .2 Lamp layout.
- .3 Where indicated submit engineered shop drawings for exterior signage.
  - .1 The engineer responsible for the production of the shop drawings is responsible for structural design, member sizes, arrangement, connections and anchoring of work of this section. Coordinate and maintain materials, dimensions, layout and appearance to meet intent of the *Contract Documents*.
- .4 Samples:
  - .1 Submit three 305 mm x 305 mm (12" x 12") samples for each sign type, each fastener type and finish specified.
  - .2 Submit full scale samples as indicated on the Sample Schedule.
- .5 Templates:
  - .1 Submit templates to *Contractor* for use by installers and fabricators as required for proper location and installation of signage.

### 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 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 *Provide* work of this section, executed by competent fabricators and installers with minimum 5 years experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-ups:

## Signage

---

- .1 Provide when requested, at the *Consultant's* discretion, mock-ups of items as requested by *Consultant* including:
  - .1 Fully functional mock-up of a typical LED sign.
- .2 Reviewed mock-ups become the standard for the work of this section.

### 1.6 Delivery, Storage, and Handling

- .1 Package or crate, and brace and wrap *Products* to prevent damage during shipment and handling. Label packages and crates according to signage numbers as listed in the signage schedule, and protect finish surfaces from environmental conditions where required.

### 1.7 Extended Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36 for a period of 5 years.
- .2 Special systems warranties:
  - .1 Standard form in which warrantor agrees to repair or replace components and assemblies that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
    - .1 Failures include, but are not limited to, the following:
      - .1 Vinyl films and sheeting, including exterior vertical exposure.
      - .2 LED sign assemblies:
        - .1 LED mortality:  $\leq 2.5\%$  @ 100,000 hours.
        - .2 LED lumen depreciation:  $\leq 30\%$  @ 50,000 hours.
  - .2 Exterior exposed paint finishes: Standard form in which manufacturer agrees to repair finishes or replace metals that shows evidence of deterioration of factory-applied finishes within specified warranty period.
    - .1 Failures to paint finish include, but are not limited to, the following:
      - .1 Colour fading more than 5 Hunter units when tested according to ASTM D2244-11.
      - .2 Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      - .3 Cracking, checking, peeling, or failure of paint to adhere to bare metal.
    - .2 Warranty period: 10 years.

## PART 2 – PRODUCTS

### 2.1 General

- .1 Refer to signage drawings for materials, dimensions and text height. Refer to signage schedule for content.

### 2.2 Performance/Design Requirements

- .1 Provide dustproof, waterproof and lightproof seams and joints for illuminated sign boxes.

## Signage

---

- .2 Provide sufficient bleed space for sign faces with framing.
- .3 Design exterior illuminated signage to meet the recommended guidelines of the International Dark-Sky Association (IDA), to minimize glare, reduce light trespass, and avoid light pollution of the night sky.

### 2.3 Metal Materials

- .1 In accordance with Section 05 50 00.
- .2 Aluminum sheet:
  - .1 Thickness: 3 mm thick unless otherwise indicated.
  - .2 Aluminum alloy:
    - .1 Painting Quality: 3003H14 to ANSI H35.1/H35.1M-2013.
    - .2 Anodizing Quality: 5005H14 to ANSI H35.1/H35.1M-2013.
- .3 Stainless steel sheet and plate: ASTM A167-99(2009), Type 304.

### 2.4 Photopolymer Process Panels

- .1 Surface raised tactile letters and symbols integrally bonded to substrate material through UV light exposure process.
- .2 Panel Material:
  - .1 Basis of design:
    - .1 Nova Polymers, 'Novacryl PT Series Photopolymer'.
  - .2 Composition: 0.8 mm thick moisture resistant, non-glare interior nylon photopolymer on ultraviolet resistant clear PETG sign base, single piece construction. Laminated photopolymers, added-on characters, and engraved characters are not acceptable.
  - .3 Base thickness: 6.0 mm non-glare PETG.
  - .4 Sustainable certification: Minimum 40 percent pre-consumer recycled content.

### 2.5 Paint Finish

- .1 Basis of design:
  - .1 Matthews Paint System (MPC).
- .2 Primer coat, as suitable for substrate (MPC).
- .3 Top coat (MPC).
- .4 Screened stamped tactile letters in contrasting colour.
- .5 Clear top coat (MPC).

### 2.6 Accessories

- .1 Drilled inserts: heavy-duty mechanical or adhesive anchor systems, in accordance with engineered shop drawings, in sizes to suit the intended end use.
  - .1 Acceptable manufacturers:

Signage

---

- .1 Hilti.
- .2 ITW Construction Products.
- .2 Gaskets: EPDM, EEMAC type 4, single lengths of preformed gaskets, bonded at the corners only, forming a monolithic seal.
- .3 Isolation coating: asphalt-base emulsion for use as a protective coating for metal, complying with ASTM D1187.
- .4 Adhesive tape:
  - .1 Acceptable Products:
    - .1 3M 'VHB Adhesive Transfer Tape F9473PC'.
    - .2 3M 'VHB Tape 4950' double sided foam tape.
- .5 Silicone adhesive:
  - .1 One-part, neutral-cure elastomeric sealant.
  - .2 ASTM C920-05 Type S, Grade NS, Class 50.
  - .3 ASTM C1184-05 Standard Specification for Structural Silicone Sealant
  - .4 Colour: clear.
- .6 Vinyl film:
  - .1 Basis of design manufacturers:
    - .1 3M Canada.
    - .2 Avery Dennison USA.
  - .2 Translucent:
    - .1 Interior glass wall safety markings:
      - .1 Basis of design:
        - .1 3M '7725SE Series'.
  - .3 Opaque:
    - .1 Interior and exterior cut-out letters, logos or graphics.
      - .1 Acceptable *Products*:
        - .1 3M Scotchcal 'ElectroCut Film 7725-20 Series'.
        - .2 Avery Dennison 'IC 600 Series'.
      - .2 Interior and exterior digitally printed/ silk-screened graphics:
        - .1 Basis of design:
          - .1 3M 'Controltac Graphic Film 180 Series'.
  - .4 Vinyl edge sealer:
    - .1 Basis of design:
      - .1 3M Edge Sealer 3950.

Signage

---

## 2.7 Electrical Requirements

- .1 LED lighting, and associated electrical work: in accordance with Divisions 26, 27, and 28 and as follows:
  - .1 Minimum amount of light incident on the sign face: 600 lux, evenly distributed.
  - .2 Colour temperature of the light emitted by the LED lamps: 5,500°K to 6,500°K.
  - .3 Colour consistency: LED colour variation for fixtures shall not exceed  $\pm 200^\circ\text{K}$ .
  - .4 Blue-light hazard: LED colour shall be maintained within safe limits, as recommended by ANSI/IESNA RP 27.1.
  - .5 Provide power supplies suitable to the installed LED modules, rated to operate at a temperature range of  $-40^\circ\text{C}$  to  $60^\circ\text{C}$ , meeting the following additional requirements:
    - .1 UL/CSA approved.
    - .2 Power factor of greater than 0.91, with an input current of less than 20% Total Harmonic Distortion (THD).
    - .3 Voltage surge protection.
    - .4 Install power supply within sign box.
  - .6 Provide heat sinks suitable for the large ambient temperature ranges to which sign boxes are exposed, to ensure that LED mortality and lumen depreciation requirements are met. Ensure that the design maintains LED operating-temperatures within the optimum range for the LED lifespan.
    - .1 Each fixture shall be designed and manufactured to keep LED junction temperatures below  $60^\circ\text{C}$  for 70,000 hours of usable life.
- .7 Internal wiring of light fixtures:
  - .1 High Temperature Wire, meeting the following requirements:
    - .1 Conductor: Tin-Plated Copper.
    - .2 Insulation: PVC, Glass Braid with High Temperature Saturant.
    - .3 Temperature Rating:  $125^\circ\text{C}$ .
    - .4 Operating Voltage: 600 Volts.
    - .5 Approvals: CSA, GTF.
  - .2 Make internal connections in accordance with reviewed shop drawings.
  - .3 Where necessary, to extend the length of the leads supplied on the power supply, lamp sockets and other devices, make splices in accordance with the manufacturer's recommendations. Use tubular compression type connections with a locked in-place nylon insulating sleeve, applied with a compression tool approved by manufacturer.
  - .4 Extend power supply primary leads via terminal blocks to the point where incoming power supply wiring enters the sign.

## Signage

---

- .8 Assemble and install electrical components within the interior of the sign boxes as shown on the reviewed shop drawings. Allow adequate clearances to facilitate removal of components for servicing, adequate ventilation and exercise special care in positioning of components to ensure easy and quick replacement.
- .9 Termination boxes shall be constructed of galvanized sheet metal products meeting the requirements of CSA C22.2 No. 56-M.
- .10 Terminal blocks for the incoming power supply shall be rated to a minimum of 20 Amp Capacity, 600 Volts, and shall accommodate up to #6 AWG wires to CSA C22.2 No. 56-M.
- .11 Provide one interior on/off switch within each illuminated signbox. The power switch shall be set to the "ON" position.

### **2.8 Cast-in-Place Concrete**

- .1 In accordance with Section 03 30 00.

### **2.9 Metal Framing**

- .1 In accordance with Section 05 50 00.

### **2.10 Finishes**

- .1 Prepare substrates to receive finishes, free of scratches, gouges, air bubbles, crazing, foreign matter, and other imperfections.
- .2 Prepare surfaces to receive finishes free of wax, oil, grease and other contaminants. Fill surface defects with a patching compound acceptable to the manufacturer and sand smooth. Tack wipe to remove dust and sanding residue.
- .3 Shop-apply primer and topcoat in accordance with the manufacturer's written instructions.
- .4 Pre-finish exposed screws and fastenings to match the finish of the aluminum and backer panel material.

### **2.11 Fabrication**

- .1 Comply with CSA B651-12, Accessible Design for the Built Environment.
- .2 Letter forms and symbols shall be digitally rendered in precise, crisp, clean forms. All letter forms shall be free of ticks, discontinuous curves, line waves, cut or ragged edges, edge buildup, bleeding, surface pinholes, and other imperfections. Unless otherwise indicated, letter forms shall be aligned to maintain a baseline parallel to the sign format.
- .3 Fabricate the extrusions with sharp, well-defined corners, true to detail.
- .4 Fabricate artwork for the sign faces from the digital files supplied by the Consultant.
- .5 Ensure the applied graphics are free of wrinkles, twists, air bubbles, and other imperfections.
- .6 Tactile lettering and characters shall be raised at least 0.8 mm above the surface; be smooth at its edges and have a tonal contrast of at least 70% with the signage background. Raised characters shall be between 16 mm and 50 mm high.
- .7 Tactile lettering shall be accompanied by Grade 1, uncontracted braille, positioned directly below the text.

## Signage

---

- .8 Sign faces shall be shop finish painted before application of vinyl or screen graphics.
  - .1 Provide clean and smooth or sandblasted edges and returns.
  - .2 Paint exposed edges and returns.
- .9 Characters and background shall be matte or other non-glare finish.
- .10 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Apply a premium-quality frame sealant at the joints for weatherproof seams.
- .11 Fabricate the *Work* free from defects impairing function, appearance, strength and durability.
- .12 Install continuous gaskets to the illuminated sign boxes, where required, to render the seams and joints dustproof, moisture-proof and lightproof.
- .13 Sign boxes shall accommodate raceways, ballast brackets, covers and internal support mechanisms, as required.
- .14 Isolation coating: where aluminum contacts masonry, concrete, or other metals, back-paint aluminum with the specified isolation coating.
- .15 Fabricate anchors, hangers, suspension supports and integration details into the existing finishes, as required. Provide temporary spacers for maintaining correct and level placement, where required.
- .16 Conceal anchors, reinforcements and attachments from view.
- .17 Clean and dress metal components free of burrs, tool and mould marks prior to finishing.
- .18 Use a one-piece, seamless extrusion for each side of the sign box.
- .19 Fabricate all sign faces in one piece, without joints.
- .20 Remove registry marks and mark-up lines used to align the graphics without marring or damaging graphic substrates.
- .21 Seal the edges of the graphics using the specified edge sealer in accordance with the manufacturer's written instructions.

## PART 3 - EXECUTION

### 3.1 Installation

- .1 Examine surfaces to which signage is to be anchored and report any unacceptable conditions. Commence work only after surfaces are acceptable.
- .2 Isolation coating: where aluminum contacts masonry, concrete, or other metals, back-paint aluminum with the specified isolation coating.
- .3 Install in accordance with signage manufacturer's specifications and templates as required for installation of work of this section.
- .4 Install the signage securely, in the correct location, level, square, plumb, at proper elevations and free of warp or twist, or as otherwise required, to achieve a safe and rigid installation. All fastenings shall be concealed or have colour matched heads.
- .5 Allow for a minimum clearance of 35 mm for opening hinged face frame, unless otherwise indicated.

## Signage

---

- .6 Before applying mounting tape, clean surfaces following the manufacturer's written instructions. After the application, allow the tape to cure for a minimum of 72 hours before testing adhesion.
- .7 Touch-up screws, fastening assemblies and scratches on the signage, to match the finish of the aluminum or backer panel material. On-site applications shall be restricted to touch ups only. Touch-up applications deemed to be excessive shall require removal and shop refinishing of the sign to the *Consultant's* approval.

### **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 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at site only if acceptable.
- .3 Remove excess materials from the *Place of the Work*.
- .4 Upon completion of the work of this section, or at such time or times as the *Contractor* shall direct, remove protective coverings and clean down the finished work.
- .5 Clean adjacent surfaces which have been soiled or otherwise marred, in an acceptable manner, to completely remove evidence of material causing same.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Toilet partitions.
  - .2 Urinal screens.
  - .3 Change cubicles.
  - .4 Shower compartments.

### **1.2 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 *Provide* work of this section, executed by competent installers with experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-up:
  - .1 *Provide* full scale washroom partition assembly to washroom location as designated by *Consultant*.
  - .2 Mock-up may be incorporated in the completed work upon acceptance of *Consultant*.

### **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 the proposed system of anchorage and materials being supplied on shop drawings.
  - .2 Show 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.

### **1.4 Closeout Submittals**

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Operation and maintenance data:

Solid Phenolic Partitions

---

- .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

## **1.5 Delivery, Storage, and Handling**

- .1 Cover exposed stainless steel surfaces with protective masking.

## **PART 2 - PRODUCTS**

### **2.1 Manufacturer**

- .1 Specifications are based on *Products* of Bobrick Washroom Equipment of Canada Ltd. The following listed manufacturers are acceptable only when in compliance with requirements of this section.
  - .1 Bradley Corporation.
  - .2 Prospec.
  - .3 Substitutions: in accordance with Section 01 25 00.

### **2.2 Partition Style**

- .1 Compartment style:
  - .1 Floor-to-ceiling mounted compartment.
- .2 Compartment options:
  - .1 No-sightline: Full height continuous stop and hinge side filler to completely eliminate sightline gaps around the door.
  - .2 Heavy duty continuous hinge: Heavy duty 1.5 mm (1/16") (16 gauge) continuous piano hinge.
- .3 Basis of design:
  - .1 Floor-to-ceiling anchored partitions, in designated male/female change rooms and washrooms:
    - .1 Water/fire resistant: Bobrick '1086G.67P Duraline Series'.
  - .2 Floor-to ceiling anchored partitions, in universal change rooms (maximum height partitions and doors):
    - .1 Water/fire resistant: Bobrick '2086G.67P Duraline Series'.
    - .2 Provide 2800 mm high panels between cubicles.
  - .3 Wall hung screens:
    - .1 Water/fire resistant: Bobrick '1085.67 Duraline Series'.

### **2.3 Materials**

- .1 Solid phenolic material: 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 thicknesses:
    - .1 Pilasters and doors shall be 19 mm (3/4").

Solid Phenolic Partitions

---

- .2 Panels shall be 13 mm (1/2").
- .2 Colour: Formica White 949-58.
- .3 Hardware:
  - .1 Fabricate from heavy gauge, Type-304 stainless steel with satin finish.
  - .2 Conceal hardware inside compartments with the exception of out-swinging doors.
  - .3 Hardware of chrome-plated "Zamac" or aluminium is unacceptable.
  - .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.
    - .2 Continuous 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.
  - .6 Hinge cover: manufacturer's standard.
- .4 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.
- .5 Levelling device: 5 mm (3/16") hot rolled steel bar; chromate-treated and zinc-plated; through-bolted to solid phenolic stile.
- .6 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.

Solid Phenolic Partitions

---

## **PART 3 - EXECUTION**

### **3.1 Installation**

- .1 General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
  - .1 Maximum Clearances:
    - .1 Pilasters and Panels: 25.4 mm (1").
    - .2 Panels and Walls: 25.4 mm (1").
- .2 Floor-and-ceiling-anchored units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- .3 Urinal screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.
- .4 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.
- .5 Secure wall brackets to blocking in steel stud walls.
- .6 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.
- .7 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* instructions.
- .2 Clean exposed surfaces using materials and methods recommended by manufacturer. Provide protection during remainder of construction period.

**END OF SECTION**

Operable Glass Partitions

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Operable glass partitions; manually operated.

### **1.2 Administrative Requirements**

- .1 Coordination
  - .1 Coordinate with *Work* of other sections, including structural sections, to ensure satisfactory and expeditious completion of the *Work* of this section.
  - .2 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*.
  - .3 Coordination of *Work*: coordinate layout, preparation of partition opening, floor flatness requirements for bottom seals, partition mounting and suspension system, and installation of *Work* of this section with *Work* of other sections.
  - .4 Coordinate floor flatness requirements for operable door system with Section 03 35 00.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19.

### **1.3 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .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.

### **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.
- .3 Shop drawings:
  - .1 Clearly indicate fabrication details, plans, elevations, hardware, support, glass door/partition weight, and installation details.
  - .2 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, methods of joining, details of field connections and anchorage, interfacing with other *Work*, fastening and sealing materials and methods.
  - .3 Submit catalogue cuts of manufactured items.

## Operable Glass Partitions

---

### .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.
  - .2 150 mm x 150 mm (6" x 6") sample of each metal type and finish.
  - .3 305 mm (12") long sample of top and bottom door rails in specified finish.
  - .4 1 sample of each hardware type in specified finish.

### .5 Test and evaluation reports:

- .1 Submit valid acoustic performance test report as prepared by an accredited acoustic testing laboratory, attesting performance of operable partition system.
- .2 Submit letter from operable partition system manufacturer certifying *Products* supplied for the *Work* of this section meet or exceed the minimum Sound Transmission Class (STC) specified herein.

### .6 Templates:

- .1 Submit templates to affected sections for use by installers and fabricators as required for proper location and installation of partition system.

## 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 instructions for inclusion in the operation and maintenance manuals including cleaning and maintenance of sliding glass doors.

## 1.6 Delivery, Storage, and Handling

- .1 Package or crate, and brace products to prevent damage during shipment and handling. Label packages and crates, and protect finish surfaces from environmental conditions where required.

## PART 2– PRODUCTS

### 2.1 Operable Glass Partition System

- .1 Acceptable manufacturers:
  - .1 Corflex
  - .2 Dorma.
  - .3 Nanawall.
- .2 Basis of design:
  - .1 Dorma 'HSW-G'.
- .3 Acceptable Product:
  - .1 NanaWall 'PrivaSee'.

### Operable Glass Partitions

---

- .4 Operation: Manually operated and top-supported series of individual glass panels.
- .5 Panels shall use two-piece, clamp-on top and bottom rail that fastens together from alternating sides.
- .6 Final closure:
  - .1 Stacking arrangement with panels stacked 135 degree transverse to travel direction.
- .7 Construction:
  - .1 Provide top reinforcement as required to support panel from suspension components and provide reinforcement for hardware attachment. Fabricate panels with concealed fasteners. Finished in-place partition shall be rigid, level, plumb, aligned with uniform joints and appearance; free of bow, warp, twist, deformation, and surface and finish irregularities.
  - .2 Dimensions: Fabricate operable glass panel partitions with manufacturer's standard panel sizes to form an assembled system of dimensions indicated, and verified by field measurements.
  - .3 Top and bottom flush mount attachments: All glass panels are secured into a standard track rail with flush-mounted high-grade stainless steel attachments. Bottom rail pivots and locks are of similar flush-mounted design.
  - .4 Bottom Rail Locking System: Engage adjacent panels by use of interlocking floor bolts to stabilize panels from movement in all directions
    - .1 Equip panel with a brass, mortised lock allowing for cylinder and/or thumb turn operation. Round bolts engage dust-proof floor strikes for security.
    - .2 Pivot panels to have mortised cylinder with key and thumb turn.
    - .3 Intermediate panels to have interconnecting floor bolts.
    - .4 Lead panels to have mortised cylinder with thumb turn.
  - .5 Top and bottom fittings shall be satin stainless steel finish.
- .8 Locking: cylinder key exterior, thumbturn interior.
- .9 Operable door:
  - .1 Single action sliding panel with pull handle and cam-action door closer, operational when frontage is closed.
  - .2 Locking: deadlock.
- .10 Glass Type: Tempered, complying with ASTM C1036, ASTM C1048, CPSC 16 CFR 1201 Categories 1 & 2, and ANSI Z97.1.
  - .1 Thickness:
    - .1 12.7 mm (1/2")
  - .2 Colour:
    - .1 Clear.

## Operable Glass Partitions

---

- .11 Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; ASTM B221 (ASTM B221M) for extrusions; manufacturer's standard strengths and thicknesses for type of use.

### 2.2 Suspension System

- .1 Basis of design: Modernfold G-150 Suspension System.
  - .1 Suspension tracks:
    - .1 Extruded aluminum with a minimum wall thickness of 5.9 mm (0.235").
    - .2 Support track with pairs of 9.5 mm (3/8") diameter threaded rods.
    - .3 Incorporate cast aluminum or mitred intersections, switches, and curves in stacking area.
    - .4 Provide alignment pins for track, intersections, switches, and curves ensuring both fit and roller surface integrity.
    - .5 Exposed track soffit:
      - .1 Factory-finished aluminum with white powder coat.
  - .2 Carriers:
    - .1 Two stainless steel trolleys with vinyl roller surfaces.
    - .2 Trolley design shall incorporate four steel tires.
    - .3 Automatic indexing of panels into stack area shall be provided by pre-programmed switches and trolleys without electrical, pneumatic, or mechanical activation.

## 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 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 and perform as intended.

### Operable Glass Partitions

---

- .2 Prepare opening and install *Work* of this section to ASTM E557-12 and to meet manufacturers' specifications and written installation instructions true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.
- .3 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.
- .4 Include reinforcing, anchorage and mounting devices required for the installation of *Work* of this section.
- .5 Backpaint aluminum surfaces between dissimilar metals, one coat of bituminous paint.
- .6 Fit joints and junction between components tightly and in true planes, conceal and weld joints where possible.
- .7 Fabricate *Products* with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that *Work* of this section will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.

### 3.3 Adjusting and Cleaning

- .1 Verify that installed *Products* function properly, and adjust them accordingly to ensure satisfactory operation.
  - .1 Upon completion of glazing, check units for squareness, alignment and smooth operation, adjust as required.
  - .2 Hardware: Adjust, test and make operational without binding or other interference likely to affect movement of panels.
- .2 Clean metal and glass surfaces upon completing installation of operable glass partitions to remove dust, loose fibres, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.
- .3 Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer that insure operable glass partitions are without damage or deterioration at time of Substantial Completion.
- .4 Refinish damaged or defective *Work* so that no variation in surface appearance is discernible.

**END OF SECTION**

Washroom Accessories

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section Includes
  - .1 Washroom accessories.
  - .2 Coordination and installation of washroom accessories as supplied by *Owner*.

### **1.2 Administrative Requirements**

- .1 Coordination:
  - .1 Templates:
    - .1 Submit templates to *Contractor* for use by installers and fabricators as required for proper location and installation of hardware.

### **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 Accessories

---

## PART 2 - PRODUCTS

### 2.1 Accessories

- .1 Incorporate reinforcing, fastenings and anchorage required for building-in of *Products*.
- .2 Basis of design:
  - .1 General washroom accessories:
    - .1 Except where specifically noted or scheduled otherwise, *Contract Documents* are based on *Products* of Bobrick Washroom Equipment of Canada Ltd.
    - .2 Subject to compliance with the requirements of the *Contract Documents*, acceptable equivalent *Products* from the following manufacturers may be used upon approval:
      - .1 ASI Watrous Inc.
      - .2 Bradley Corporation.
  - .2 Electric dryers:
    - .1 Hand dryers: Dyson.
    - .2 Hair dryers: World Dryer Limited.
  - .3 Swimsuit spinner (dryer):
    - .1 Suitmate.
  - .4 Adult change table:
    - .1 Pressalit.
  - .5 Substitutions: in accordance with Section 01 25 00.
- .3 Lettering: for identification of accessories and operation instructions shall be silk screened using international symbols unless otherwise specified.
- .4 Washroom accessories: in accordance with Section 10 28 01 – Washroom Accessories Schedule.

### 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 Installation

- .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.

## Washroom Accessories

---

- .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.

### 3.2 Barrier Free Installation Heights

- .1 Install accessories to permit operable parts and controls to be accessed at 1100 mm (43") maximum above finished floor, unless otherwise indicated.

### 3.3 Installation of Washroom Accessories

- .1 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.
- .2 Insulate surfaces to prevent electrolytic action due to contact with dissimilar metals, or concrete or masonry if required. Use bituminous paint or other approved means.
- .3 Install in accordance with manufacturer's installation instructions, on built-in concealed solid backing materials. Grab bar installation shall be able to withstand 250 kg downward force.
- .4 Verify locations and mounting heights with *Consultant* before roughing-in.
- .5 Install plumb, level, straight, tight and secured, centred between joints on masonry and tile walls.
- .6 Electric powered washroom accessories: install and connect in accordance with manufacturer's written recommendations, the requirements of Division 26, and the requirements of authorities having jurisdiction.

### 3.4 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: 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**

Washroom Accessories Schedule

**PART 1 – GENERAL**

**1.0 General Notes**

- .1 Read in conjunction with 10 28 00 - Washroom and Accessories.

**1.1 Accessories Schedule:**

GRB1	Grab Bar	Bobrick, 38mm Diameter Straight Grab Bar 610mm (Horizontal)	Type 304 stainless steel with "NAAMM Brushed No.4" finish with "knurled" gripping surface	
GRB2	Grab Bar	Bobrick, 38mm Diameter 90 Degree Grab Bar, 762x762mm		
GRB3	Grab Bar	Bobrick, 38mm Diameter Straight Grab Bar 1000mm (Vertical)		
GRB4	Grab Bar	Bobrick, 38mm Diameter 90 Degree Grab Bar, 915x762mm		
GRB5	Grab Bar	Bobrick, 38mm Diameter Straight Grab Bar 610mm (Vertical)		
HDD	Hand Dryer (Electric)	Dyson Airblade V	Sprayed nickel	
HDDBF	Hand Dryer (Barrier-free, Electric)			
HRD1	Hair Dryer (Adult Height, Electric)	World Dryer Limited 'Nova 5' Push button	White	
HRD2	Hair Dryer (Child Height, Electric)			
CH	Coat Hook	Bobrick 'Stainless Steel Clothes Hook B-233'	Type 304 stainless steel with "NAAMM Brushed No.4" finish	
CHBF	Coat Hook (Barrier-free, Collapsible)	Frost "Code 1150" single stainless steel safety coat hook	Stainless Steel	
SDI1	Soap Dispenser (Vanities)	Bobrick 'Surface-Mounted Soap Dispenser for Antibacterial Soaps 818615'	Type 316 stainless steel with satin finish	
SDI2	Soap Dispenser (Showers)	Dispenser Amenities 'Dispenser III 31334'	Satin Silver	
SD	Soap Dish (Barrier-free, Recessed)	Bobrick 'Recessed Heavy-Duty Soap Dish B-4380	Type 304 stainless steel with "NAAMM Brushed No.4" finish	
TPH	Toilet Paper	Bobrick 'Surface Mounted Muli-roll	Type 304 stainless steel	

Washroom Accessories Schedule

	Holder	Toilet Tissue Dispenser B4288'		
ND	Napkin Disposal	Bobrick 'Contura Series Surface Mounted Sanitary Napkin Disposal B-270'	Type 304 stainless steel with "NAAMM Brushed No.4" finish	
PTD	Paper Towel Dispenser	Bobrick 'Surface Mounted Roll-Paper-Towel Dispenser B-2860'	Type 304 stainless steel	
SFBF	Shelf (Barrier-free)	Bobrick 'Stainless Steel Shelf B-295' 405mm long x 125mm wide	Type 304 stainless steel with "NAAMM Brushed No.4" finish	
SF	Shelf	Bobrick 'Stainless Steel Shelf B-295' 405mm long x 125mm wide	Type 304 stainless steel with "NAAMM Brushed No.4" finish	
SHSBF	Folding Shower Seat (Barrier-free)	Bobrick 'Reversible Solid Phenolic Folding Shower Seat B-5181'	Solid phenolic	
STSP	Swimsuit Spinner (Dryer)	Suitmate 'Swimsuit Water Extractor'	N/A	Requires power
ACTP	Adult Change Table (Power Assisted)	Pressalit 'Care 3000 Special Needs Changing Table R8538' 1800 mm length, 700 mm height adjustable, electric motor and safety rail	N/A	Requires power
BCS	Baby Change Station	Koala Care 'Horizontal, Wall Mounted Baby Changing Station 'KB110-SSRE'	Stainless Steel	
USF	Utility Shelf	Bobrick 'Utility Shelf with Mop/Broom Holders and Rag Hooks B-244x36'	Type 304 stainless steel with "NAAMM Brushed No.4" finish	

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Prefinished metal lockers.

### **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 metal, fabricating methods, assembled banks of lockers, bases, trim, numbering, filler panels, end panels, and tops.
- .4 Samples:
  - .1 Submit sample of colour and finish on actual base metal.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Steel materials:
  - .1 Base steel, for all components unless otherwise indicated:
    - .1 To ASTM A1008/A1008M-11, free of imperfections.
    - .2 Base steel finish: Galvanneal coating designation ZF120 (A40).
  - .2 Stainless steel, where specified, scheduled, or indicated:
    - .1 To ASTM A167-99(2009), Type 304, commercial grade stainless steel.
- .2 Lockers: to CAN/CGSB 44.40-2001 AMEND.
  - .1 Types and sizes: in accordance with Locker Schedule on drawings.
  - .2 Components:
    - .1 Frame: 1.61 mm thick (16 gauge), Galvanneal.
    - .2 Top: 1.61 mm thick (16 gauge), Galvanneal.
    - .3 Sides: 0.70 mm thick (24 gauge), Galvanneal.
    - .4 Back: 0.70 mm thick (24 gauge), Galvanneal.
    - .5 Bottom: 1.61 mm thick (16 gauge), Galvanneal.
    - .6 Filler and end panels: 1.61 mm thick (16 gauge), Galvanneal.
    - .7 Doors:
      - .1 Outer panel: 1.61 mm thick (16 gauge), Galvanneal.

Prefinished Metal Lockers

---

- .2 Inner (liner) panel: 0.70 mm thick (24 gauge), Galvanneal.
- .3 Fully welded, double wall construction.
- .8 Hinges:
  - .1 1.61 mm thick (16 gauge), Galvanneal.
  - .2 Continuous, full-length integral piano hinge.
- .9 Door strikes:
  - .1 1.61 mm thick (16 gauge), Galvanneal.
  - .2 Continuous, full-length strike. Two polyurethane bumpers per door.
- .10 Locking system:
  - .1 Suitable for padlocks.
  - .2 Single point latching through a single piece recessed pocket. Single piece hasp welded to both legs of the channel frame member.
  - .3 Latch pocket: 2.75 mm thick (12 gauge) stainless steel.
  - .4 Hasp: 5.00 mm (3/16") thick, cold rolled steel, Galvanneal.
- .11 Shelves: 1.61 mm thick (16 gauge), Galvanneal.
- .3 Coat hooks:
  - .1 Single and double tier lockers: 3 round tipped metal hooks fastened to body.
  - .2 Triple tier lockers: 1 double prong hook fastened to underside of top (shelves).
- .4 Ventilation: Airflow shall be achieved through slots or perforations in doors or horizontal frame members.
- .5 Number plates: Anodized aluminum number plate riveted onto the body or door pull or each door, numbered sequentially starting at "1" for each locker Type as directed by the *Consultant*. No logo or name allowed.
- .6 Locker finish; exposed and semi-exposed surfaces: baked on polymer powder or alkyd enamel, custom Bright White colour to approval of the *Consultant*. Frame, accessories, and hardware shall match door colour unless otherwise indicated.
- .7 Basis of design *Products*:
  - .1 Lincora Group '50 Series Nova Lockers'.
  - .2 Perfix Inc. 'F70'.
  - .3 Substitutions: in accordance with Section 01 25 00.

## PART 3 - EXECUTION

### 3.1 Installation

- .1 Install fully-welded preassembled lockers in accordance with manufacturer's printed installation instructions.
- .2 Securely fasten at least every third locker through to wall studs, masonry or concrete substrate.

Prefinished Metal Lockers

---

- .3 Install trim and filler panels where required for continuous appearance and where obstructions occur. Specific conditions as indicated.
- .4 Install finished panels at tops of infill panels to enclose void spaces between lockers and adjacent surfaces.
- .5 Install finished end panels to exposed ends of locker banks.

**3.2 Installation Tolerances**

- .1 Install plumb, level, tight and secured. Comply with the following tolerances:
  - .1 Plumb and level: 3 mm (1/8").
  - .2 Variation from indicated position: plus/minus 3 mm (1/8").

**END OF SECTION**

Solid Phenolic Lockers

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Solid phenolic lockers.

### **1.2 Administrative Requirements**

- .1 Read and be governed by conditions of the *Contract* and sections of Division 1.

### **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 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 Aluminum:
  - .1 Aluminum sheet: aluminum alloy 5052 to ANSI H35.1/H35.1M-2013. Exposed sheet shall be machine flattened free of distortions, resquared sawcut edges.
  - .2 Aluminum extrusions: Accurately formed, extruded aluminum alloy ASTM B221-14: AA-6063-T5/T6, free from defects impairing appearance, strength and durability.
  - .3 Finishes:
    - .1 Concealed surfaces: bright mill finish.
    - .2 Exposed and semi-concealed surfaces: powder coated, custom colour to later selection by *Consultant*.
- .2 Stainless steel, where specified, scheduled, or indicated:
  - .1 To ASTM A167-99(2009), Type 316, commercial grade stainless steel.
- .3 Solid phenolic panels:
  - .1 Solidly fused plastic laminate with matte-finish melamine surfaces, coloured face sheets, and black phenolic-resin core that is integrally bonded with exposed black edges milled and polished

Solid Phenolic Lockers

---

- .2 Finish: rough matte finish.
- .3 Colour: Custom colour to later selection by *Consultant*.
- .4 Lockers:
  - .1 Types and sizes: in accordance with Locker Schedule on drawings.
  - .2 Components:
    - .1 Bodies; one of the following:
      - .1 0.9 mm aluminum sheet bodies with rolled radius rear internal corners.
      - .2 Phenolic panels, 8 mm thick, minimum.
    - .2 Door frames:
      - .1 Extruded aluminum profiles.
    - .3 Doors: phenolic panels, 12 mm thick, minimum.
    - .4 Base, top, and shelf units; one of the following:
      - .1 High impact ABS injection moulding.
      - .2 Phenolic panels, 10 mm thick, minimum.
      - .3 Aluminum sheet, 1.6 mm thick, minimum.
    - .5 Filler and end panels: phenolic panels, 10 mm thick, minimum.
    - .6 Edge treatment: phenolic panels, bull-nosed with radius corners.
    - .7 Provide trims, end panels and closure pieces as required.
    - .8 Locking system:
      - .1 5 mm reinforced aluminum hasp and clasp, suitable for padlocks.
    - .9 Hinges:
      - .1 Constructed of extruded aluminum with stainless steel pivot pin, Type 304 or Type 316.
      - .2 Provide 2 per door for multi-tier units and 3 for full height doors, spring loaded for automatic door closing.
  - .3 Coat hooks;
    - .1 Fabricated from one of the following:
      - .1 Aluminum.
      - .2 11 gauge stainless steel, Type 304, with satin finish.
    - .2 Number and type of hooks:
      - .1 Single and double tier lockers: 3 round tipped metal hooks fastened to body.
      - .2 Triple tier lockers: 1 double prong hook fastened to underside of top (shelves).
  - .4 Ventilation: 9.5 mm slot back of top and intermediate shelves, and one at front of bottom shelf.

Solid Phenolic Lockers

---

- .5 Number plates: Anodized aluminum number plate riveted onto the body or door pull or each door, numbered sequentially starting at "1" for each locker Type as directed by the *Consultant*. No logo or name allowed.
- .6 Acceptable Products:
  - .1 'Marathon Phenolic Lockers' by Prospec US Inc.
  - .2 'Columbia Solid Phenolic 6831L' by Columbia Lockers.
  - .3 Substitutions in accordance with Section 01 25 00.

### **PART 3 - EXECUTION**

#### **3.1 Installation**

- .1 Install lockers in accordance with manufacturer's printed installation instructions.
- .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 panels at tops of infill panels to enclose void spaces between lockers and adjacent surfaces.
- .5 Install finished end panels to exposed ends of locker banks.

#### **3.2 Installation Tolerances**

- .1 Install plumb, level, tight and secured. 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**

## **PART 1 - GENERAL**

### **1.1 Summary**

.1 Section Includes:

- .1 Swing gates.

### **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 manufacturers' installation instructions.

.3 Shop drawings:

- .1 Layout of equipment, mounting bolt locations, electric power requirements, and installation details, wiring diagrams, conduit runs and control wiring.
- .2 Submit markings and designs of messages on signs, and notices to *Consultant* for review.

### **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 Manufacturers:

- .1 Company specializing in manufacturing *Products* specified in this section, with minimum 10 years experience.

.2 Installers / applicators / erectors:

- .1 Execute work of this section using an installer who has adequate equipment and skilled workers to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified.

### **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.

### **1.6 Field Conditions**

- .1 Coordinate the work in this section with other appropriate sections of the specifications to ensure proper scheduling for fabrication and installation of the work in this section.

## **PART 2 – PRODUCTS**

### **2.1 Pedestrian Control System**

- .1 Basis of design:
  - .1 Turnstile Security Systems Inc. '2 way Auto Swing Gate'.
- .2 Single swing gate.
- .3 Arm opening: 990 mm, unless otherwise indicated.
- .4 Gate post: 3.2 mm thickness, 114 mm diameter tube.
- .5 Two way operation.
- .6 Finish: satin stainless steel finish.
- .7 Controls:
  - .1 Controlled access entry.

## **PART 3- EXECUTION**

### **3.1 Examination**

- .1 Finished floor substrate shall be level in accordance with equipment manufacturer's written requirements.
- .2 Notify *Consultant* in writing of conditions, which would be detrimental to installation. Commencement of work implies acceptance of previously completed work

### **3.2 Electrical**

- .1 Supply of electrical power to terminal box in each unit is specified in Divisions 26, 27, and 28.
- .2 Conduit, wiring and electrical power supply to control system components and card reader system shall be under work of Divisions 26, 27, and 28.
- .3 *Provide* other electrical wiring, conduit junction boxes, transformers, circuit breakers and auxiliary components required for complete installation. Conform to CSA and authorities have jurisdiction.

### **3.3 Installation**

- .1 Installation of system in accordance with equipment manufacturer's written instructions.
- .2 Locate equipment where indicated and in accordance with reviewed shop drawings.
- .3 Test and adjust complete system for proper function and leave in perfect working order.

### **3.4 Adjusting and Cleaning**

- .1 Verify that installed equipment 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.

### **3.5 Closeout Activities**

#### **.1 Demonstration**

- .1 Before acceptance of system, arrange for demonstration of equipment 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 48 hours advance notice in writing of demonstration date.
- .2 Conduct comprehensive demonstration for *Owner's* staff on operation and care of parking control system.

**END OF SECTION**

Projection Screens

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section Includes:
  - .1 Power operated projection screens.

### **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 duplicate samples of each finish specified.
- .4 Shop drawings:
  - .1 Clearly indicate fabrication details, plans, elevations, hardware, and installation details.
- .5 Templates:
  - .1 Submit templates for use by installers and fabricators as required 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 manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

### **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 *Contractor*.

## **PART 2 - PRODUCTS**

### **2.1 Projection Screen**

- .1 Projection screen; motorized: ceiling closure with mounting brackets to suit mounting installation.
- .2 Acceptable *Products*:
  - .1 Draper model 'Targa'.
  - .2 Or approved alternative by Da-lite.
  - .3 Substitutions: in accordance with Section 01 25 00.

## Projection Screens

---

- .3 Method of installation: Ceiling mounted. Mounted in site constructed recess provided under Section 09 29 00.
- .4 Viewing screen: fibreglass, matte white, fire and mildew resistant, 1778 mm x 1778 mm (70" x 70") viewing surface.
- .5 Screen case: Fabricated in one piece from 0.08 mm (0.03") 22-gauge steel sheet with scratch resistant white polyester finish. End caps with integral roller brackets and universal mounting brackets for wall or ceiling mounting, finished to match case..

### 2.2 Power Supply

- .1 Power supply: 120V AC 60 Hz.

## 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 Incorporate reinforcing, fastenings and anchorage required for building in of *Products*.
- .3 Install work to meet manufacturers' recommended specifications, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.
- .4 Include reinforcing, anchorage and mounting devices required for the installation of each *Product*.
- .5 Fit joints and junction between components tightly and in true planes, conceal and weld joints where possible.
- .6 Fabricate *Products* with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that projection screens will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.
- .7 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.
- .8 Electrical wiring, hook-up, switches: in accordance with Divisions 26, 27, and 28.

### 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 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**

Television Mounts

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section Includes:
  - .1 Television mounts to locations 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 shop drawings for each type of installation and fabrication in accordance with Section 01 33 00.
  - .2 Indicate location, size, arrangement, hardware, anchor or mounting details, and accessories.
- .4 Samples:
  - .1 Submit 3 samples of each component of framing system for approval in accordance with Section 01 33 00. Do not order materials until samples are approved. Samples shall fully represent materials to be supplied in colour, sheen, finish and construction.
  - .2 Submit 3 – 300 mm (12") square samples each type and colour of scrims and fabric from which *Owner* selects final colour. Submit samples of typical seaming method, hems and attachment to metalwork details for general workmanship and methods.

### **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 Instructions shall include specific warning of maintenance and cleaning operations, practices or materials which may damage or disfigure the metal or fabric components.

### **1.5 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors:

## Television Mounts

---

- .1 *Provide* work of this section, executed by competent installers with experience in application of *Products*, systems and assemblies specified, and with approval and training of *Product* manufacturers.
- .2 Mock-ups:
  - .1 Provide when requested, at the *Consultant's* discretion, mock-ups of items as requested by *Consultant*.
  - .2 Reviewed mock-ups become the standard for the Work.

## PART 2 - PRODUCTS

### 2.1 Materials

- .1 TV mounts:
  - .1 Fixed wall mount accommodating standard sized TV monitors, constructed with height and width adjustment, pre-drilled mounting plate, and cut-outs to accommodate wiring.
  - .2 Finish: powdercoat finish, colour: Black.

## PART 3 - EXECUTION

### 3.1 Installation

- .1 Install television mounts in locations indicated and in accordance with manufacturer's instructions.
- .2 Adjust television mounts for proper operation, and instruct *Owner* in proper operation thereof.

### 3.2 Adjusting and Cleaning

- .1 Clean surfaces after installation using manufacturer's recommended cleaning procedures.

**END OF SECTION**

## **PART 1- GENERAL**

### **1.1 Summary**

- .1 Section Includes
  - .1 Patient lift and track system; ceiling-mounted.

### **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 Shop drawings:
  - .1 Submit engineered shop drawings for the following:
    - .1 Patient lift and track systems, and track support framing assemblies, including anchoring and connections for work of this section.
    - .2 Clearly indicate, materials, finishes, fabrication details, dimensions, thicknesses, plans, elevations, hardware, fastenings, and installation details.
    - .3 Indicate proposed site connections, fasteners and methods.
- .4 Samples:
  - .1 Submit duplicate 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 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 Qualifications:
  - .1 Installers / applicators / erectors:

Patient Lift

---

- .1 *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.
- .2 Manufacturer:
  - .1 Manufacturer shall have minimum of 10 years of continued experience, having successfully completed other laboratory projects of similar or greater magnitude.

## **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 Patient Lift and Track System (Ceiling-Mounted)**

- .1 Basis-of-design:
  - .1 BHM Medical 'Fixed Ceiling Lift V4'.
- .2 Fixed ceiling lift:
  - .1 Maximum load capacity: 200 kg (440 lb).
  - .2 2300 mm (90.6") foot strap to allow vertical lift movement from floor.
  - .3 Vertical displacement speed: 35 mm/s (1.4 inch/s).
  - .4 Horizontal displacement speed: 200 mm/s 7.9 inch/s).
  - .5 Construction:
    - .1 Frame: steel.
    - .2 Cover: plastic.
  - .6 Slings:
    - .1 PRISM 8A2400, Universal Mesh/Poly - Medium size.
    - .2 PRISM 8A2200, Universal Mesh/Poly - XL size.
  - .7 Power operation:
    - .1 Batteries: Quick change batteries, 24 VDC (2 x 12 VDC), 5.0 AH as recommended by lift manufacturer.
    - .2 Audible low battery indicator and visual battery/charge level display.
    - .3 Digital LCD display indicator: indicates number of lifts, battery levels, and lift status.
    - .4 Auto shut-off when not in use to conserve battery life.
    - .5 Emergency stop and emergency power lowering, with emergency manual raising or lowering.
    - .6 Hand control: Pneumatic hand control with programmable features.

Patient Lift

---

- .3 Track system; fixed track: Track system as recommended by patient lift manufacturer.
  - .1 Prefinished extruded aluminum track profile, including extruded aluminum ceiling brackets and white moulded styrene track end caps:
    - .1 Accurately formed, extruded aluminum alloy AA-6063-T6 to ANSI H35.1/H35.1M-2013 minimum, free from defects impairing appearance, strength and durability.
    - .2 Finish: Powder coat finish, white colour.
  - .2 Fastenings and connectors: Types as recommended by ceiling lift manufacturer.
    - .1 Prepainted fasteners, with finish/colour to match prefinished track for exposed locations.
  - .3 *Provide* framing and suspension system components as recommended by ceiling lift manufacturer, for a complete track system installation, compatible with and to suit finished ceiling assemblies.
  - .4 Dielectric separator: Quick drying non-staining alkali resistant bituminous paint to CAN/CGSB 1.108-M89, or membrane type to acceptance of *Consultant*.

## PART 3- EXECUTION

### 3.1 Installation

- .1 Install equipment in accordance with equipment manufacturer's written instructions 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.
- .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. Coordinate work of this section with work of Divisions 26, 27, and 28.
- .6 Mechanical *Subcontractor* shall be responsible for final mechanical service connections. Coordinate work of this section with work of Divisions 21, 22, and 23.

### 3.2 Installation – Patient Lift

- .1 Install equipment in accordance with equipment manufacturer's written instructions 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.

Patient Lift

---

- .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. Coordinate work of this section with work of Divisions 26, 27, and 28.

**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.

**3.4 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*.

**3.5 Closeout Activities**

- .1 Testing:
  - .1 Test and commission equipment in accordance with equipment manufacturer's written instructions.
- .2 Demonstration:
  - .1 Before acceptance of system, arrange for demonstration of equipment 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 48 hours advance notice in writing of demonstration date.
  - .2 Conduct comprehensive demonstration for *Owner's* staff on operation and care of equipment.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Roller window sun shades, manual control (RWS1)
  - .2 Roller window room darkening (black-out) shades, manual control (RWS2).

### **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 flammability performance data.
  - .3 Submit manufacturers' installation instructions.
- .3 Letters of general conformity:  
Submit professional letters of general conformity for the work of this section.
- .4 Shop drawings:
  - .1 Submit shop drawings or fully dimensioned catalogue cuts.
  - .2 Window treatment schedule: Use same designations indicated on *Contract Documents*.
  - .3 Clearly indicate general construction, configurations, jointing methods and locations, fastening methods, handing of controls, required blocking locations, banding (tandem shades), and installation details.
- .5 Samples:
  - .1 Submit samples of each material and finish colour selected and each accessory.

### **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 Qualifications:
  - .1 Manufacturers:

## Roller Window Shades

---

- .1 Company specializing in manufacturing the *Products* specified in this section, with minimum 10 years experience.
- .2 Installers / applicators / erectors:
  - .1 Work of this section shall be by forces in the direct employ or under control of the system manufacturer, skilled, trained, and experienced in work of similar scope and complexity.
- .2 Mock-ups:
  - .1 Erect 1 full size mock-up each roller shade type at the *Place of the Work* for review. Completed and accepted mock-up shall act as the standard to which balance of the work of this section will be judged.

### 1.6 Delivery, Storage, and Handling

- .1 Before delivery to the *Place of the Work*, check each shade for operation; remove finger marks and smudges.
- .2 Package *Products* to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.

## PART 2 - PRODUCTS

### 2.1 Acceptable Manufacturers

- .1 *Contract Documents* are based on the following *Product*:
  - .1 Hunter Douglas 'RB500 Series, Heavy Duty'.
- .2 Subject to compliance with the requirements of the *Contract Documents*, acceptable equivalent *Products* from the following manufacturers may be used upon approval:
  - .1 Lutron Shading Solutions.
  - .2 Solarfactive Products Ltd.
  - .3 Substitutions: in accordance with Section 01 25 00.

### 2.2 Hardware – Manual Controlled Shades

- .1 Chain operated, with infinite positioning. Left or right hand operation and banding as applicable to suit *Place of the Work* condition.
  - .1 Drive assembly:
    - .1 Must allow finger tip control and include a built in shock absorber system to prevent chain breakage under normal operating conditions;
    - .2 Capable of being field adjusted from the exterior of the shade unit without having to disassemble the hardware.
    - .3 Drive Chain: No. 10 stainless steel bead chain formed in a continuous loop. The chain shall have passed a 40 kg (90 lb) load test.
      - .1 *Provide* child-safe chain retainers.
- .2 Control shades and room darkening shades independently.

Roller Window Shades

---

## 2.3 Assembly

- .1 *Provide* fully factory assembled shade unit consisting of 2 shade brackets, one piece extruded aluminum shade tube, extruded aluminum fascia, aluminum profile hembars, extruded vinyl fabric spline, and fabric as specified.
- .2 Fabric shall hang straight, without shifting sideways more than 3 mm (1/8") in either direction due to warp distortion or weave design.
- .3 Factory modify housings where necessary to bypass columns.
- .4 End brackets: a two piece moulded ABS construction with nylon drive sprocket. Bracket colour shall coordinate with the fascia colour.
- .5 Shade tube: Minimum 1.52 mm (0.060") thick extruded aluminum with three equally spaced continuous stiffening fins, non-sag design, maximum deflection under full load of fabric L/700.
- .6 Fascia: Minimum 1.5 mm (1/6") thick extruded aluminum.
- .7 Hembar: Extruded aluminum with matching plastic end finials.
- .8 Mounting: Removal of shade system shall not require the disassembly of the shade unit.
- .9 Room darkening shade features: 13 mm (1/2") pile mounted in prefinished 38 mm x 28 mm (1-1/2" x 1-1/8") extruded aluminum side and bottom channels finished to match mullions. Include Dynamic hembar to allow for variance in window sill level. Locations as indicated on drawings.

## 2.4 Shade Mounting System

- .1 Extruded aluminum bracket designed to accept preassembled shade system.
  - .1 Brackets to be used to facilitate the alignment with shade opening.
- .2 Modular construction: Shades must be removable as a complete modular unit without any component disassembly required.

## 2.5 Aluminum Finish

- .1 Exposed aluminum: Baked enamel, colour to match window mullion finish.
- .2 Unexposed aluminum: mill finish.

## 2.6 Shade Fabric Types

- .1 RWS1, Sun control, 3% openness:
  - .1 Basis of design:
    - .1 Solarfactive 'Solarblock'.
- .2 RWS2, Room darkening:
  - .1 Basis of design:
    - .1 Solarfactive 'Solarstop'.
- .3 Colour: as selected by *Consultant* from manufacturer's full range.

Roller Window Shades

---

- .4 Fabric shall hang flat, without buckling or distortion. Edge, where trimmed, shall hang true and straight, without shifting sideways more than 3 mm (1/8") in either direction due to warp distortion or weave design.
- .5 Fabric shall be colour fast, retain its shape, and not be affected by moisture or heat.
- .6 Flammability performance:
  - .1 Certified by an independent laboratory, shade fabric shall pass CAN/ULC S109-03 Flame Tests of Flame Resistant Fabrics and Films.

## **2.7 Fabrication**

- .1 Finished assemblies shall be, square, true to size and free from distortion, twist, or other defects that could affect their strength, operation or appearance. Factory applied finish shall be uniform, smooth and without blemishes.

## **PART 3 - EXECUTION**

### **3.1 Installation**

- .1 Install shade systems in plumb, squared, adequately anchored, maintaining uniformed clearances, accurate alignment levels, and parallel with the window plane. Fabric shall not travel more than 3 mm (1/8") in either direction within channels after installation.
- .2 Fabric shall be pre-measured and manufactured off-site.
- .3 Shades shall be snapped into place without screws or visible fasteners.
- .4 Incorporate reinforcing, fastening and anchorage required for installation of shades.
- .5 Securely attach installation fittings to their mounting surfaces with stainless steel or hardened aluminum screws of proper length and type, and durable anchors.
- .6 Install shade roller true and level, and with cloth to hang flat without buckling or distortion.
- .7 Room darkening shades to be installed to eliminate passage of light from exterior.

### **3.2 Adjusting and Cleaning**

- .1 Verify that installed shade 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.

### **3.3 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 shade manufacturer to assure proper function, operation and explanation.
  - .2 Conduct comprehensive demonstration for *Owner's* staff on operation and care of interior window treatments.

**END OF SECTION**

Entrance Floor Mats

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Entrance floor mats.

### **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 Layout of floor mats including direction of traffic, dimensions, profiles, and accessories.
- .4 Samples:
  - .1 Submit duplicate samples of each type of mat specified.

### **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 Delivery, Storage, and Handling**

- .1 Package *Products* to prevent damage during shipment and handling. Label packages, and protect finish surfaces from environmental conditions where required.

## **PART 2 - PRODUCTS**

### **2.1 Entrance Floor Mats**

- .1 Basis of design:
  - .1 3M 'Nomad Extreme Traffic Z-Web Unbacked Scraper Matting 9100'.
- .2 Construction: unbacked nonwoven continuous vinyl filaments.
- .3 Thickness: 11 mm (7/16").
- .4 Colour: to later selection by *Consultant* from manufacturer's standard range.

## **PART 3 - EXECUTION**

### **3.1 Preparation**

- .1 Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

Entrance Floor Mats

---

- .1 Do not proceed until unsatisfactory conditions have been corrected.
- .2 Manufacturer shall offer assistance and guidance to provide a template of irregular shaped grid assemblies where applicable to ensure a proper installation.

**3.2 Installation**

- .1 Install the work of this section in accordance with the manufacturer's recommendations.
- .2 Set grid type at height recommended by manufacturer for most effective cleaning action.
- .3 Coordinate top of grid surfaces with bottom of doors that swing across to provide ample clearance between door and grid.
- .4 Install work to meet manufacturer's written specifications and installation instructions, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.

**3.3 Adjusting and Cleaning**

- .1 Verify that installed *Products* function properly, and adjust them accordingly to ensure satisfactory operation.
- .2 Replace damaged or defective work so that no variation in surface appearance is discernible.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Trash and litter receptors.
  - .2 Bicycle Rack.

### **1.2 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product* data sheets:
  - .1 Submit data and installation instructions for materials and prefabricated devices, providing descriptions sufficient for identification at the *Place of the Work*.
- .3 Shop drawings:
  - .1 Clearly indicate fabrication details, plans, elevations, hardware, and installation details.
- .4 Samples:
  - .1 Submit 2 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.

### **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.

### **1.4 Delivery, Storage, and Handling**

- .1 Package or crate, and brace products to prevent damage during shipment and handling. Label packages and crates, and protect finish surfaces from environmental conditions where required.

## **PART 2 - PRODUCTS**

### **2.1 Bicycle Racks**

- .1 Basis of design:
  - .1 Landscape Forms 'Bola Bike Rack'.
    - .1 Finish: stainless steel AISI #4.

Site Furnishings

---

**2.2 Accessories**

- .1 Drilled fasteners: Series 300 stainless steel #8 Robertson.
- .2 Bolt, nut, washer, screw and pin type fasteners: Series 300 stainless steel.
  - .1 Use surface fastenings of following types, except where specific type is indicated.
    - .1 To solid masonry and concrete use expansion bolts.

**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 bike racks in accordance with manufacturers' specifications and installation instructions, 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.

**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**

Splash Pad

---

## **PART 1 - GENERAL**

### **1.1 Section Includes**

- .1 Work of this section includes construction of new splash pad, together with complete filtration systems, finishes, and installation of equipment indicated or required for a complete installation under the responsibility on a single *Subcontractor*.

### **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*:
  - .1 Submit manufacturer's detailed technical *Product* data and installation instructions for each principal component or *Product*, and include certified test reports of required testing. List and describe features of control system, performances, and operating characteristics.
- .3 Shop drawings:
  - .1 Submit shop drawings.
  - .2 Shop drawings will include plans of splash pads including plan layout of fixtures, sections of vault, equipment, and fixture cuts, and shows the relationship of the splash pad elements to each other and to all adjacent elements of the building. Indicate layout and configuration, cross sections, materials and finishes, equipment locations, dimensions, details of assembly, reinforcing, anchors, water stops, joints, and utility rough-in locations. Show schematics, layouts, locations, of built-in pool and filtration equipment.
  - .3 Submit power wiring diagrams for control and interlock wiring.

### **1.4 Closeout Submittals**

- .1 Submit as-built documents, record drawings, and operation and maintenance manuals and service data in accordance with Section 01 77 00 and as specified in this section.
- .2 Include the following information in 3 copies of a separate bound editions pertaining to splash pad:
  - .1 As-built documents and record drawings:
    - .1 Provide as-built drawings in accordance with Section 01 77 00.
    - .2 Provide a complete set of record drawings of the entire splash pad system and underground piping. Show the location and depth of piping.
    - .3 List of equipment including *Product* name, model number, size, parts lists, pump curves, manufacturer and closest service representative (name, address, telephone number).
    - .4 Shop drawings and manufacturer's printed assembly/wiring diagram or servicing drawings.
  - .2 Operation and maintenance manuals and service data:

## Splash Pad

---

- .1 Equipment function, normal operating characteristics, and limiting conditions.
  - .2 Assembly, installation, alignment, adjustment and checking instructions.
  - .3 Manufacturer's step-by-step operating instructions for startup, routing and normal operation, regulation and control, shutdown and emergency conditions for each filter and pool recirculation system including backwash.
  - .4 Operating cycles shall be specifically described in outline format and in referenced detail. A legible wall-mounted colour-coded piping flow diagram shall be provided in equipment room.
  - .5 Comprehensive step-by-step operating instructions for each different piece of equipment forming part of splash pad system.
  - .6 Include manufacturer recommended maintenance schedule, parts lists, piping diagram (to agree with wall mounted diagram) and troubleshooting information for all splash pad mechanical equipment. Provide motor warranty depot for each and every motor manufacturer.
- .3 Submit copies of operation and maintenance and service data manuals prior to the start-up instruction.

### 1.5 Quality Assurance

- .1 Qualifications:
- .1 *Provide the work of this section by a Subcontractor who has adequate plant, equipment, and skilled workers to perform the work 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, who is completely familiar with referenced standards and requirements of the work of this section, and with approval of Product manufacturers.*

### 1.6 Existing Conditions

- .1 Before commencement of the work of this section, examine the *Place of the Work* and report unsatisfactory conditions in writing to the *Consultant*.

### 1.7 Warranty

- .1 Warrant work of this section for a period of 2 years in accordance with Section 01 78 36.

## PART 2 - PRODUCTS

### 2.1 Regulatory Requirements

- .1 In addition to the building code, splash pad and associated systems shall meet requirements other authorities having jurisdiction.
- .2 Obtain all required inspections and permits, as applicable.

### 2.2 Materials

- .1 Stainless steel structural tubing: Type 304/304L, structurally strong, durable, and resistant to corrosive environments. Rigid centricast fibre reinforced (FRP) and/or moulded fibreglass, filament wound tubing, galvanized steel, or aluminum shall not be utilized for any distribution systems manifolds.

### Splash Pad

---

- .2 Bronze: Backflow devices and pressure regulators shall be manufactured from copper-rich alloy. Plastic such as PVC, and Nylon shall not be utilized.
- .3 Mounting and Assembly Hardware: Shall be 304/304L stainless steel. Exposed and accessible hardware shall be tamper resistant, requiring a special tool for removal to deter vandalism and theft.
- .4 Rigid corrosion proof: only stainless steel 316L or reinforced Fibreglass to be used in contact with water, either in the in-water equipment, or on deck equipment, unless specifically indicated otherwise.
- .5 Fill under splash pads: In accordance with Section 31 23 00.
- .6 Concrete: in accordance with Section 03 30 00.
- .7 Concrete reinforcement: in accordance with Section 03 20 00.
- .8 Sealant:
  - .1 Two component polysulphide to CAN/CGSB 19.24-M90 Type 2 Class A, light grey colour.
    - .1 Acceptable *Product*:
      - .1 Duoflex by Sika Canada Inc.
    - .2 Substitutions: in accordance with Section 01 25 00.
- .9 Joint filler: at expansion joints where indicated, 12 mm (1/2") rigid extruded styrofoam insulation, Styrofoam SM by Dow Chemical; seal as above.

### 2.3 Subterranean Command Centre

- .1 Subterranean command center shall be a pre-fabricated water distribution system containing piping, valves and electrical wiring, factory assembled; water pressure tested, and shall be delivered from the Splash pad equipment manufacturer's facilities. They shall be equipped with threaded connections for the water inlet and slip-on for water outlets. The solenoid valves shall be pre-wired to the controller or to a junction box (when the controller is placed in a remote location). The installer shall provide the plumbing equipment required from the water source to the water inlet or backflow device and Pressure regulator if so configured. The installer shall provide the plumbing equipment required from the water outlets to the splash pad Play Products, as well as adequate drainage ball valves at the low point of each of the Play Product's water distribution lines (if applicable). Should the controller be located remotely, Splash pad equipment manufacturer shall supply 3 m (10'-0") of wire on the controller and 3m (10'-0") of wire on the junction box; if more than 6 m (20'-0") of wire is required, the installer shall supply the rest of the electrical equipment. The grounding of the junction box shall be done by the installer.
  - .1 Subterranean command centers: Shall consist of aluminum reinforced frame and access hatch suitable for use in public spaces. Side walls shall be panelled with ABS sheets predrilled for all applicable water line inlets and outlets. The access hatch shall be constructed of 6 mm (1/4") thick, reinforced; powder coat painted aluminum checker plate, and shall be lockable using a standard padlock. For equipment servicing, an integrated corrosion resistant step down pedestal/seat shall be included. Hardware shall be stainless steel. 50 mm (2") backflow and pressure regulating equipment, when supplied by manufacturer, is installed within the vault enclosure.

---

Splash Pad

---

- .2 Water distribution manifolds: Constructed of 89 mm (3 1/2") outside diameter stainless steel structural tubing with a power coat painted finish. Each water distribution port shall be a 38 mm (1-1/2") NPT connection. The manifold shall be equipped with a pressure gauge. Welded joints shall be watertight and pressure tested to 150 psi.
- .3 Solenoid valves: There shall be one solenoid valve installed on each of the water distribution ports for the Play Products. They shall be a normally closed 24 VAC 50/60 cycle solenoid actuated globe/angle pattern design. The valve pressure rating shall not be less than 150 psi. The valve body and bonnet shall be constructed of PVC with stainless steel fasteners. The valve shall have a manual override capability (manual open/close control). It shall house a fully encapsulated, one-piece solenoid. Each Solenoid valve shall have an integrated flow control adjustment valve stem for fine tuning of spray effects.
- .4 Piping and fittings: Piping and fittings shall be at least schedule 40 PVC. Factory-assembled components, fitting and connections shall be water pressure tested prior to delivery.
- .5 Electrical enclosures, conduit, wiring and connections: Electrical wiring shall be # 18 AWG with a 600V rating. Electrical connections, enclosures, and conduit shall be Nema 4x watertight.

## 2.4 Programmable Logic Controller

- .1 When configured with FT SmartTouch™ Controller:
  - .1 Programmable logic controller shall be sized according to the number of outputs it is required to control. Programmable logic controller shall be factory programmed with a variety of spray sequences designed according to the requirements of the *Project*. It shall have the flexibility to modify the sequences using either a transportable memory cartridge or via the touch pad user interface.
  - .2 Owner shall be able to set the operational hours of the facility via the touch pad user interface. The 24hr/7day timer can be programmed with up to two time intervals that can be scheduled each day.
  - .3 Operating system's touch pad user interface shall allow for manual override controls for each connected device, activation device(s), and timer. (i.e. Manual, Off and Automatic modes)
  - .4 Operating system shall be housed in a corrosion resistant moulded fiberglass NEMA 4X rated enclosure. Exposed hardware shall be 304/304L stainless steel and shall include a lockable access door.
  - .5 Operating system shall have the capacity to receive signals from an activation device, operating on 24VDC.
  - .6 Operating system shall contain a 120 VAC primary / 24 VAC secondary transformer or 240 VAC primary / 24 VAC secondary transformer with built-in electrostatic shield protection.
  - .7 Operating system shall have the ability to automatically purge all water lines based on the user selected time and duration (i.e. every day at 5 am). It shall also, be configured to purge all lines after a user defined period of inactivity (i.e. after 4 hours of inactivity).

Splash Pad

---

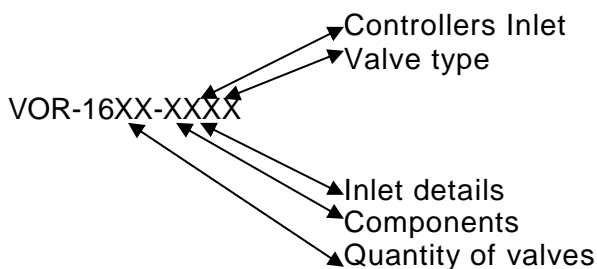
- .8 Operating system shall softly start ramp up and shall softly stop ramp down.
- .9 Operating system can activate up to a maximum of three play area.
- .10 Operating system has an option of a rain diverter support.
- .11 The sequence time could be changed on site.
- .2 When configured with FT SmartFlow Logics<sup>TM</sup> Controller:
  - .1 Splash pad programmable logic controller shall be sized according to the number of outputs it is required to control. The programmable logic controller shall be factory programmed with a variety of spray sequence designed according to the requirements of the project. It shall have the flexibility to user modify the sequences using a Key Pad user interface. A battery backup and low battery alarm shall protect the system memory.
  - .2 A 24hr/7day user programmable time switch, which shall allow the user to set the operational hours of the facility, shall be incorporated into the operating system. The time switch shall have the ability to be programmed with a different time schedule for each day of the week, and up to 2 time schedules per day.
  - .3 Operating system shall be supplied with a key pad user interface with controls for each output, activation device(s), and time switch. The 2 line 20 character display screen shall be visible to 3ft, and with a 45 degree viewing angle.
  - .4 Operating system shall be housed in a corrosion resistant NEMA 4X rated enclosure, complete with stainless steel lockable latches.
  - .5 Operating system shall have the capacity to receive signals from activation devices, operating on 24VDC.
  - .6 Operating system shall have the capacity to operate based on a programmed sequence or based on a randomly generated sequence. In random mode each touch of the activator will generate a new unique sequence.
  - .7 Operating system shall have the capacity to accept an entry for a fixed run time interval. (i.e. run for x hrs, regardless of the operation time clock settings.)
  - .8 Operating system shall have the ability to soft-start ramp up and ramp down the Splash pad to minimize potential water hammer.
  - .9 Operating system shall have the ability to automatically purge all water lines based on the user selected time and duration (i.e. every day at 5 am). It shall also, be configured to purge all lines after a user defined period of inactivity (i.e. after 4 hours of inactivity).
  - .10 Operating system shall have the ability to be upgraded using DataKey memory stick.
  - .11 Operating system shall have the option of using a membrane keypad locking mechanism, requiring a user configurable password to access the Controller functions.
  - .12 Operating system shall have the ability to automatically purge all water lines based on the user selected time and duration (i.e. every day at 5 am). It shall also, be configured to purge all lines after a user defined period of inactivity (i.e. after 4 hours of inactivity).

Splash Pad

.3 When configured with WR SmartTouch™ Controller:

- .1 Programmable logic controller shall be sized according to the number of outputs it is required to control. Programmable logic controller shall be factory programmed with a variety of spray sequences designed according to the requirements of the *Project*. It shall have the flexibility to modify the sequences using either a transportable memory cartridge or via the touch pad user interface.
- .2 Owner shall be able to set the operational hours of the facility via the touch pad user interface. The 24hr/7day timer can be programmed with up to two time intervals that can be scheduled each day.
- .3 Operating system's touch pad user interface shall allow for manual override controls for each connected device, activation device(s), and timer. (i.e. Manual, Off and Automatic modes)
- .4 Operating system shall be housed in a corrosion resistant moulded fibreglass NEMA 4X rated enclosure. Exposed hardware shall be 304/304L stainless steel and shall include a lockable access door.
- .5 Operating system shall have the capacity to receive signals from an activation devices, operating on 24VDC.
- .6 Operating system shall contain a 120 VAC primary / 24 VAC secondary or 240 VAC primary / 24 VAC secondary transformer with built- in electrostatic shield protection.
- .7 Operating system shall have the ability to automatically purge all water lines based on the user selected time and duration (i.e. every day at 5 am). It shall also, be configured to purge all lines after a user defined period of inactivity (i.e. after 4 hours of inactivity).
- .8 Operating systems shall have the ability to provide a 24VAC auxiliary signal. This signal can be used to trigger a relay for Pumps, Lights, etc.
- .9 Operating system will softly start ramp up and will softly stop ramp down.
- .10 Operating system can activate up to a maximum of three play area.
- .11 Operating system has an option of a rain diverter support.
- .12 The sequence time could be change on site.

**2.5 Configuration**



**Components**

BFP: Backflow preventer  
PR: Pressure regulator

Splash Pad

---

- 0= BFP, PR
- 1= No BFP, No PR
- 2= BFP out, PR
- 3= No BFP, PR
- 9= Unique number for custom system

**Inlet details**

- 0= 1 x 2" inlet
- 1= 1 x 2" inlet with junction box
- 2= 2 x 2" inlets
- 3= 1 x 3" inlet
- 4= 2 x 3" inlets
- 5= 2 x 2" inlets with junction box
- 6= 1 x 3" inlet with junction box
- 7= 2 x 3" inlets with junction box
- 9= Unique number for custom system

**Controllers**

- FT : Flow through
- WR: Water recirculation

- 0= Controller not included
- 2= FT SmartTouch Controller 120V
- 3= WR SmartTouch Controller 120V
- 6= FT SmartTouch Controller 240V
- 7= WR SmartTouch Controller 240V
- 9= Unique number for custom system
- A= FT SmartFlow Logics Controller 120V
- B= FT SmartFlow Logics Controller 240V

**Valve type**

- 0= Standard Solenoid Valve
- 1= Brass Solenoid valve
- 3= Standard Solenoid Valve with Ball Valve 9= Unique number for custom system

**2.6 Play Products**

- .1 Play *Product* Structure Ground Geyser VOR-301:
  - .1 Constructed of 304/304L stainless steel with an outside diameter of 75 mm (3"). The brass spray cap and winter cap shall be threaded into the geyser body using a tamper-resistant tool. Tamper resistant winter caps shall be included. The anchoring system shall have an integrated levelling system facilitating installation and a plumb finished to the activity deck surface.
  - .2 Overall play *Product* dimensions: 130 mm (5") overall height.

Splash Pad

---

- .3 Play *Product* interactivity: Users can touch the soft frothy water falling down in contrast to the more powerful streams spraying up from the centre.
- .4 Hydraulic activity/components: Spray cap shall have a ten hole spray pattern angled at 5° from vertical so that multiple streams spray water out at symmetrical angles forming an elegant fountain effect.
- .5 Hydraulic requirements: 5-10 gpm (19 – 38 lpm) at 5-10 psi (0.3 – 0.7 bar). Low consumption nozzles that minimize water usage while maximizing spray effects are also available.
- .2 Play *Product* Wall Spray VOR-302.
  - .1 Constructed of 304/304L stainless steel 127 mm L x 127 mm W (5" x 5").
  - .2 Jet stream effect creating spray zone of 3353 mm x 427 mm.
  - .3 Hydraulic requirements: 38 – 57 lpm (10-15 gpm) at 0.3 – 0.7 bar (5-10 psi).
- .3 Play *Product* Structure Bollard Activator VOR-611:
  - .1 Constructed of 304/304L stainless steel structural tubing with an outside diameter of 114 mm (4 1/2") and a wall thickness of 3 mm (.120"). The activator shall have no moving parts and run on a low voltage electrical supply. A 14 AWG (2,5mm²)-2 wire conductor is to be used for the electrical connection. The activation cap shall consist of a high impact-resistant protective cap and a piezo switch. The protective cap shall be constructed of polished stainless steel and shall be secured in place using tamper-resistant fasteners. The Safeswap anchoring and leveling system shall be used.
  - .2 Overall play *Product* dimensions: 990 mm (39") height above final grade.
  - .3 Play *Product* interactivity: Bollard Activator shall be the direct interface between the users of the aquatic play area and the aquatic play *Products*. The pre-programmed sequences of the aquatic play *Products* shall be activated only when the touch-activated sensor cap on the Bollard Activator is touched by the user.
  - .4 Hydraulic activity/components: Not applicable.
  - .5 Hydraulic requirements: Not applicable.
  - .6 Acceptable alternative: : Rain Drop Products ' Bollard Activator' BOL-A001'.
- .4 Play *Product* Jet Stream No. 1 VOR 7512:
  - .1 Ground mounted jet stream sprayer.
  - .2 Jet stream effect creating spray zone of 1524 mm x 1524 mm.
  - .3 Flow: 7.57 - 26.50 lpm.
  - .4 Pressure: 0.34 – 0.69 bar.
- .5 Play *Product* Silhouette No. 2 VOR 7773:
  - .1 Pole mounted jet stream sprayer with elastomeric toe guard.
  - .2 Jet stream effect creating spray zone of 1830 mm x 3060 mm.
  - .3 Flow: 7.57 – 11.36 lpm.
  - .4 Pressure: 0.34 – 0.69 bar.

## Splash Pad

---

- .6 Play *Product* Magic Mist No. 2 VOR 8099:
  - .1 Ground mounted misty jet sprayer.
  - .2 Misty jet stream effect creating spray zone of 4572 mm x 4572 mm.
  - .3 Flow: 11.36 – 22.71 lpm.
  - .4 Pressure: 0.69 – 1.72 bar.
- .7 Drain:
  - .1 Play *Product* Playsafe Drain.
  - .2 Stainless steel construction.
- .8 Pump:
  - .1 Kaiser & Kuhne Freizeitgerate 'Water Pump 0-33130-001 with valve combination 0-33190-000'.
  - .2 Stainless steel, moulded case pump, pump mechanism with roller and friction bearing, foot pipe connection 32 mm (1-1/4").

### 2.7 Finishes

- .1 Stainless steel.

### 2.8 Fabrication

- .1 Edges shall be machined to a rounded edge.
- .2 Welds shall be watertight, buffed smooth, or polished to a non-visible finish and factory pressure tested. Accessibility to the water distribution systems shall be such that no permit for confined spaces would be required as per OSHA Standards.

## PART 3 - EXECUTION

### 3.1 Installation - General

- .1 Comply with manufacturer's instructions, Product drawings, and shop drawings for assembly splash pad, and for installation of required equipment and accessories.
- .2 Before commencing concrete pours, verify electrical bonding of splash pad embedded items and reinforcing steel and verify that any required electrical, plumbing or building inspections have been performed.
- .3 Electrical connections: Main power electrical connections to the Splashpad Controller shall be performed in accordance with requirements of authorities having jurisdiction.

### 3.2 Splash Pad Installation

- .1 Do excavation, trenching, backfilling, and compaction in accordance with Section 31 23 00.

### 3.3 Splash Pad Deck Installation

- .1 Install splash pad deck drains to achieve code compliance for drainage or as indicated on drawings.
- .2 Pour concrete slabs over compacted backfill.

Splash Pad

---

- .3 Ponding of water on deck is unacceptable. Areas where ponding occurs shall be removed and reinstalled.
- .4 Seal expansion and control joints in pool tanks and decks with sealant as specified.

**3.4 Equipment Installation**

- .1 Install equipment in accordance with manufacturer's printed instructions.
- .2 Metal within 3 m (9.8 ft) of splash pad to be grounded in accordance with Divisions 26, 27, and 28.
- .3 Deliver items to be cast-in or incorporated in work of other sections and supervise installation of same.
- .4 Cooperate with *Owner's* representative and other contractors as they install equipment not included in the work of this section.

**3.5 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00 and as specified below in this section. Independent inspection and testing company shall attend the pre-installation meeting.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

**3.6 Cleaning and Protection**

- .1 Clean exposed and semi-exposed surface. Touch-up finishes to restore damaged and soiled areas.
- .2 Protect and maintain conditions necessary to ensure that splash pad and equipment will be without damage or deterioration at date of *Substantial Performance of the Work*.

**END OF SECTION**

Swimming Pool Tanks and Decks

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Swimming pool tanks and deck constructed in place.

### **1.2 Administrative Requirements**

- .1 Pre-installation meeting:
  - .1 The *Contractor* shall schedule and conduct pre-installation meetings for swimming pool tanks as specified herein and in accordance with Section 01 31 19.
  - .2 Pre-installation meeting for swimming pool tank work shall occur at least 2 months prior to commencement of swimming pool tank work at the *Place of the Work*.
  - .3 Attendees:
    - .1 In addition to attendees specified in Section 01 31 19, attendees at swimming pool tank pre-installation meeting shall include *Subcontractors* responsible for or affected by the work of the following sections:
      - .1 03 10 00 Concrete Formwork.
      - .2 03 15 20 Integral 03 15 20 Waterproofing.
      - .3 03 20 00 Concrete Reinforcement.
      - .4 03 30 00 Cast-in-Place Concrete.
      - .5 13 11 13 Swimming Pool Tanks and Decks.
      - .6 13 11 20 Swimming Pool Waterproofing and Tiling.
      - .7 13 11 21 Pool Tiling Schedule.
      - .8 13 11 46 Swimming Pool Accessories.
      - .9 13 11 47 Pool Accessories Schedule.
      - .10 13 11 56 Movable Swimming Pool Floors.
      - .11 Divisions 22, 23, and 26.
      - .12 31 23 00 Excavation and Backfill.
    - .2 Independent inspection and testing company shall attend pre-installation meeting.
  - .4 Agenda:
    - .1 Refer to table appended to this section.

### **1.3 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 *Product Data*:

Swimming Pool Tanks and Decks

---

- .1 Submit manufacturer's detailed technical *Product* data and installation instructions for each principal component or *Product*, and include certified test reports of required testing. List and describe features of control system, performances, and operating characteristics.
- .3 Shop drawings:
  - .1 Submit engineered shop drawings.
  - .2 Shop drawings will include plans of all pool tanks including an overall plan of the Filtration Room and Aquatic Hall which shows the relationship of the tanks to each other and to all adjacent elements of the building. Indicate pool layout and configuration, pool tank cross sections, materials and finishes, gutters, equipment locations, dimensions, details of assembly, reinforcing, anchors, water stops, joints, and utility rough-in locations. Show schematics, layouts, locations, of built-in pool and filtration equipment.
  - .3 Submit power wiring diagrams for control and interlock wiring.
- .4 Certificates:
  - .1 Submit to the *Owner* copies of inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of swimming pools.
- .5 Test and evaluation reports:
  - .1 Submit written and verified pressure test reports for every pool pipe installed underground.
- .6 Survey:
  - .1 Submit copy of survey specified under Part 3 of this section to the *Consultant*.

#### 1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Submit as-built documents, record drawings, and operation and maintenance manuals and service data in accordance with Section 01 77 00 and as specified in this section.
- .3 Include the following information in 1 electronic (pdf) copy and in 3 copies of a separate bound editions pertaining only to swimming pools:
  - .1 As-built documents and record drawings:
    - .1 Provide as-built drawings in accordance with Section 01 77 00.
    - .2 Provide a complete set of record drawings of the entire pool system and underground piping. Show the location and depth of piping.
    - .3 List of equipment including *Product* name, model number, size, parts lists, pump curves, manufacturer and closest service representative (name, address, telephone number).
    - .4 Shop drawings and manufacturer's printed assembly/wiring diagram or servicing drawings.
  - .2 Operation and maintenance manuals and service data:
    - .1 Equipment function, normal operating characteristics, and limiting conditions.

Swimming Pool Tanks and Decks

---

- .2 Assembly, installation, alignment, adjustment and checking instructions.
- .3 Manufacturer's step-by-step operating instructions for startup, routing and normal operation, regulation and control, shutdown and emergency conditions for each filter and pool recirculation system including backwash.
- .4 Operating cycles shall be specifically described in outline format and in referenced detail. A legible wall-mounted colour-coded piping flow diagram shall be provided in equipment room.
- .5 Comprehensive step-by-step operating instructions for each different piece of equipment forming part of pool system.
- .6 Include manufacturer recommended maintenance schedule, parts lists, piping diagram (to agree with wall mounted diagram) and troubleshooting information for all pool mechanical equipment.
- .7 Provide a 760 mm x 900 mm (30" x 36") wall chart for each pool and spa filter system, as well as a reduced photocopy of each wall chart in the maintenance manuals. Using reference to keyed valves and wall diagram, include specific written instructions for procedures to be followed for:
  - .1 Emptying and refilling the pools including de-watering during the period that the pool will be empty.
  - .2 Filter operation and backwashing.
  - .3 Super chlorination.
  - .4 Water level control and adjustment/.
  - .5 Chemical controllers.
  - .6 Lubrication and maintenance instructions.
  - .7 Guide to "troubleshooting".
  - .8 Parts list and predicted life of parts subject to wear.
  - .9 Test all motors and provide written confirmation.
  - .10 Specific written instructions for procedure for emptying and refilling the pools including de-watering during any period that the pool will be empty. Provide a red sign with minimum 25.4 mm (1") letters in the equipment room reading as follows: WARNING DO NOT DRAIN POOL WITHOUT FOLLOWING THE PROCEDURES IN THE POOL OPERATION MANUAL.
  - .11 Provide 213 mm x 275 mm (8-1/2" x 11") laminated pump curve for each and every pump, posted next to the specific pump.
- .8 A reduced sized photocopy of the total equipment room and pool equipment schematic shall be included in maintenance manual.
- .3 Submit copies of operation and maintenance and service data manuals prior to the start-up instruction.

## 1.5 Quality Assurance

- .1 Qualifications:
  - .1 Installers / applicators / erectors:

## Swimming Pool Tanks and Decks

---

- .1 *Provide* the work of this section by a *Subcontractor* who has adequate plant, equipment, and skilled workers to perform the work 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, who is completely familiar with referenced standards and requirements of the work of this section, and with approval of *Product* manufacturers.
- .2 Aspects of the work of this section are required to be prepared by a professional engineer. Refer to Section 01 33 00 for specific details and requirements in this regard.

### 1.6 Field Conditions

- .1 Before commencement of the work of this section, examine the *Place of the Work* and report unsatisfactory conditions in writing to the *Consultant*.
- .2 Designate reference datum points for location of pool tanks.
- .3 Begin construction of the pool tank only after the area is protected from rain and snow.

### 1.7 Warranty

- .1 Warrant work of this section for a period of 5 years in accordance with Section 01 78 36 and as follows:
  - .1 Warranty includes no leakage in concrete pool tanks and piping.
  - .2 Warranty period for defects in materials or workmanship of the pool structure causing a loss of water: 10 years.
  - .3 Warranty period for defects in material or workmanship of the pool piping systems: 5 years.
  - .4 Warranty requirements and duration for pool secondary waterproofing and tiling systems: in accordance with Section 13 11 20.
  - .5 Pool accessories and pool gutter grates specified under Section 13 11 46.

## PART 2 - PRODUCTS

### 2.1 Performance/Design Requirements

- .1 Provide design and layout information as required.
- .2 Concrete pool tanks are designed to be waterproof prior to application of additional waterproofing membranes. Follow ACI 350 Committee recommendations for watertight structures.
- .3 Work of this section includes construction of new pool tank, together with complete filtration systems, finishes, and installation of equipment indicated or required for a complete installation under the responsibility on a single *Subcontractor*. Work includes, but is not limited to the following:
  - .1 Pool deck drains: provide deck drain trenches and grates, including setting beds required to achieve deck slopes indicated. Coordinate penetrations through the deck slab. Plumbing below the deck slab shall be provided by Division 22.
  - .2 Pool tank and foundations:

Swimming Pool Tanks and Decks

---

- .1 Final 200 mm (8") of compacted fill under pool tank in accordance with Section 31 23 00.
- .2 Construction of concrete tank, including formwork, reinforcing, accessories, poured concrete, waterproofing admixture, waterstops, inserts, control joints.
- .3 Pool decks (in areas indicated), setting beds.
- .3 Pool deck drains and associated plumbing.
- .4 Tank, deck and wall finishes, to extents indicated or scheduled; ceramic tile finish, secondary waterproofing, joint sealants, tank markings as indicated and as required by the building code and coordinated with authorities having jurisdiction, and in accordance with Section 13 11 20.
- .5 Backfilling with clean sand around filtration plumbing.
- .6 Pool Filtration System, including filter tanks and any related tanks, plumbing, skimmers, outlets, nozzles, airjets, drains, and the like, that form part of the system shall be in accordance with Divisions 21, 22, and 23.
- .7 Design, supply, and installation of electrical equipment in accordance with Section 22 51 00 and Division 26, including:
  - .1 Electrical connections and associated electrical equipment, materials, and labour for the associated pool re-circulation systems within the Pool Filtration Room.
  - .2 Electrical materials and labour associated with the 600 V, 3 phase and/or 120/208 V, 1 or 3 phase connections to pool pumps and equipment, and 120 V branch circuit connections (hardwired or 120 V outlets) required for pool associated equipment.
  - .3 Connections to electrical panels, including the supply and installation of associated breakers.
  - .4 Standard housekeeping outlets are by Division 26.
- .8 Supply and installation of electrical grounding and bonding of metal in pool tanks, and within 3 m (9.8 ft) of pool tanks, in accordance with the Canadian Electrical Code (latest edition).
- .9 Coordination with *Owner* and suppliers for other equipment.
- .10 Supply and installation of pool accessories and pool gutter grates in accordance with Section 13 11 46.
- .11 Supply and installation of housekeeping pads, hangers, fire stops, pipe seals through sleeves, thrust blocks, anchorage and supports for pool piping and equipment. Furnish pipe sleeves for installation by other trades at the proper locations.
- .12 Supply and installation of master emergency stop buttons and timers.
- .13 Concrete surge tanks:
  - .1 Construction of concrete surge tanks, including waterstops and primary waterproofing by Division 03.

## Swimming Pool Tanks and Decks

---

- .2 Applied coating, access hatches and ladders, and installation of pool plumbing systems as part of the work of this section.
- .14 Supply and installation of floor access hatches.
- .4 Regulatory Requirements
  - .1 Design, fabricate and install work of this section to requirements of the building code and other authorities having jurisdiction.
  - .2 In addition to the building code, pool and associated systems shall meet requirements of the Department of Health and Wellness regulations.
  - .3 Obtain all required inspections and permits, as applicable.

### 2.2 Materials

- .1 Ferrous metals: only stainless steel 316L to be used in the Aquatics Hall, unless specifically indicated otherwise.
- .2 Fill under tanks: In accordance with Section 31 23 00.
- .3 Concrete: in accordance with Section 03 30 00.
- .4 Integral waterproofing admixture (primary waterproofing): in accordance with Section 03 15 20.
- .5 Concrete reinforcement: in accordance with Section 03 20 00.
- .6 Waterstops:
  - .1 PVC waterstops:
    - .1 Basis of design:
      - .1 Durajoint.
    - .2 Subject to compliance with performance requirements the following manufacturers are acceptable:
      - .1 Sika Greenstreak.
    - .3 Wall to floor joints (vertical installations): Type 3, 100 mm (4") length, 4.7 mm (3/16") thickness.
    - .4 Floor to wall joints (horizontal installations): Type 500 Split ribbed type, 150 mm (6") length, 9.5 mm (3/8") thickness.
    - .5 Wall to wall control joints: Type 5, 150 mm (6") length, 9.5 mm (3/8") thickness
    - .6 Floor to floor control joints: External 'Base Seal' type: Type 62, 228 mm (9") length, 4.7 mm (3/16") depth.
  - .2 Adhesive waterstops:
    - .1 Surge tank walls, subject to approval by Consultant.
    - .2 Basis of design:
      - .1 Henry 'Synko-Flex Waterstop'.
  - .3 Hydrophilic (swell-seal) waterstop:
    - .1 Gutter perimeter at wall control joints.

## Swimming Pool Tanks and Decks

---

### .2 Basis of design:

#### .1 OCM 'Adeka P-201'.

.7 Pipe penetrations: seal around pipe penetrations in method suitable to installation conditions.

### .8 Sealant:

.1 For joints in ceramic tile: in accordance with Section 13 11 20.

.2 For joints other than in ceramic tile: two component polysulphide to CAN/CGSB 19.24-M90 Type 2 Class A, white colour when adjacent white grout, light grey in other areas of pool tanks.

#### .1 Basis of design: Duoflex by Sika Canada Inc.

### .9 Floor access hatches:

.1 Single leaf, light duty, aluminum door, 3.16" flat plate lid reinforced for 4.9 kg/m<sup>2</sup> (150 lb/ft<sup>2</sup>) live load.

.2 150 mm (6") angle frame with 25.4 mm (1") recessed pan for tile installation.

.3 Stainless steel compression spring.

.4 Stainless steel hinge pin.

.5 Stainless steel hardware.

.6 Type 316 stainless steel snap lock.

.7 Automatic hold-open arm.

.8 Aluminum flush mounted lift handle.

#### .9 Sizes:

.1 Surge Tanks from Pool Deck areas: 762 mm x 762 mm (30" x 30").

### .10 Basis of design:

#### .1 Surge Tanks from Pool Deck areas:

##### .1 Pennsylvania Insert Corp 'AERL3030S'.

.10 Applied flexible waterproofing membrane, at pool gutters and surge tanks coating: in accordance with Section 13 11 20.

.11 Pool tiling system, including secondary waterproofing: in accordance with Section 13 11 20.

.12 Swimming pool accessories, deck drains (trench drains), and pool gutter grates: in accordance with Section 13 11 46.

## 2.3 Pool Filtration System

.1 Pool filtration system shall be in accordance with Divisions 21, 22, and 23.

## 2.4 Surge Tank Ladders

.1 CSA HA5 aluminum 6351-T6 and low density polyethylene drive-in style climbing ladder.

#### .1 Basis of design:

Swimming Pool Tanks and Decks

---

.1 MSU 'Model 360 Alum - Poly Step Drive-in Style'.

## **2.5 Fabrication Tolerances**

- .1 Tank Length (Lap Pool): +15 mm to 0 mm.
- .2 Tank Width (Lap Pool): +25 mm to 0 mm.
- .3 Diagonal length difference (Lap Pool):  $\pm 25$  mm.
- .4 Depth (all Pools): +25 mm to 0 mm.
- .5 Tank Markings:  $\pm 5$  mm.
- .6 Location of Inserts:  $\pm 5$  mm.

## **PART 3 - EXECUTION**

### **3.1 Installation - General**

- .1 Comply with manufacturer's instructions and shop drawings for assembly of swimming pool and pad, and for installation of required equipment and accessories.
- .2 Before commencing concrete pours, verify electrical bonding of swimming pool embedded items and reinforcing steel and verify that any required electrical, plumbing or building inspections have been performed.

### **3.2 Pool Tank Installation**

- .1 Do excavation, trenching, backfilling, and compaction in accordance with Section 31 23 00.
- .2 Cast under-tank filtration system piping into concrete.
- .3 Set and cast equipment into concrete as required. Refer to Division 03 for materials and methods for concrete construction and remedial work.
- .4 Waterstops:
  - .1 Install continuous waterstops where indicated or required to prevent leakage, and to manufacturer's instructions. Build waterstops into forms and support against displacement during pouring of concrete. Do not displace concrete reinforcing when installing waterstops.
  - .2 Use butted, welded connections in accordance with manufacturer's recommendation. Only straight heat sealed welds shall be performed in the field. Use preformed or shop welded corners and intersections.
- .5 Install expansion and construction joints between concrete tanks and slabs as indicated. Align joints with tile grout lines to avoid cutting finish tile. Seal joints with approved sealants.

### **3.3 Surveying**

- .1 Measure the length of the lap pool and bottom slopes of each pool tank bottom.
  - .1 Measure location of each pool tank to confirm location relative to other elements in the Aquatic Hall.
  - .2 Measurements to be performed by a Registered Nova Scotia Land Surveyor.

## Swimming Pool Tanks and Decks

---

- .3 Perform measurements prior to installation of waterproofing and tile work.

### **3.4 Pool Deck Installation**

- .1 Install pool deck drains to achieve code compliance for drainage.
- .2 Pour concrete slabs over compacted backfill. Allow for tile setting bed.
- .3 Seal expansion and control joints in pool tanks and decks with sealant as specified.

### **3.5 Pool Tile and Secondary Waterproofing Installation**

- .1 *Provide* secondary waterproofing where indicated and in accordance with Section 13 11 20.
- .2 *Provide* pool tile in tanks and on surrounding pool decks complete including base in accordance with Section 13 11 20.
- .3 Expansion and construction joints in concrete tanks and slabs must align with tile joints.

### **3.6 Flexible Cementitious Waterproofing Membrane Installation**

- .1 *Provide* flexible waterproofing membrane at pool gutters and surge tanks in accordance with Section 13 11 20.

### **3.7 Floor Access Hatch Installation**

- .1 Final door locations to be reviewed and confirmed by Consultant.
- .2 Rigidly secure frames to floor assembly, flush with adjacent floor finish.
- .3 Install in accordance with door manufacturer's written instructions.
- .4 Adjust Work to ensure free-running, tightly closing operation. Ensure that installation is free from warp, twist or other distortion. Lubricate operating hardware.

### **3.8 Equipment Installation**

- .1 Install equipment in accordance with manufacturer's printed instructions.
- .2 Provide connections to the pool grounding loop in accordance with Divisions 26, 27, and 28. Connect all reinforcing bar in the pool structure and all metal pool fittings and accessories within 3050 mm (10 ft) of the pool tanks or as otherwise required by authorities having jurisdiction.
- .3 Deliver items to be cast-in or incorporated in work of other sections and supervise installation of same.
- .4 Cooperate with *Owner's* representative and other contractors as they install equipment not included in the work of this section.

### **3.9 Swimming Pool Accessories Installation**

- .1 Install swimming pool accessories in accordance with Section 13 11 46.

### **3.10 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00.
  - .1 Provide quality control for concrete testing in accordance with Division 03.

Swimming Pool Tanks and Decks

---

- .2 Conduct pressure tests of all buried or encased piping with water at 170 kPa (24.7 psi) for 12 hours minimum prior to concreting and backfilling.
- .3 Pour concrete or backfill only around piping under 170 kPa (24.7 PSI) pressure. Monitor pressure during and for a minimum of 12 hours after concreting and backfilling.
- .4 Testing for watertightness:
  - .1 Provide 2 waterproofing tests of the pool tanks at the following milestones:
    - .1 Test 1: Minimum 28 days after concrete placement and when the concrete has developed sufficient strength as determined by the *Consultant*, and after high-pressure water blast specified under Section 13 11 20.
    - .2 Test 2: After thin-set porcelain tile work is complete, with setting bed and grout materials properly cured and after start-up procedures are complete.
- .5 Testing procedures:
  - .1 Test 1:
    - .1 Clean out pool and surge tank structures, remove foreign matter that inhibits the performance of the materials being used. Plug drains, outlets and shut valves. Test hydrostatic pressure relief valves.
    - .2 Fill pool and surge tank at a rate of 25 mm (1") per hour to a depth of 100 mm (4") below the overflow channel (gutter). Allow water to remain at this depth for 24 hours to ensure that drains, returns and other penetrations are not leaking.
    - .3 After 24 hours fill to the lip and flood the overflow channel (gutter).
    - .4 Let water stand in pool for 48 hours to allow for absorption by concrete. Top up the pool water level.
    - .5 Fill a control bucket with water. Mark pool and bucket. Let water stand in pool tank, gutter and bucket for 72 hours.
    - .6 Record water and air temperature and relative humidity of the pool area every 8 hours.
    - .7 Every 12 hours, check the water level in the pool tank and gutter, and compare it with the water level in the pail. Document test every 12 hours.
    - .8 Test for 72 hours. Any loss more than 10 mm in a 24 hour period will require repairs.
    - .9 Drain pool, locate and repair leakage, if any, working from the interior, undercutting and patching using the same concrete mixture as pool, mixed with bonding agent, except coarse aggregate shall be left out. Retest until pools are watertight. Do not apply waterproofing membrane and tile work until pools are watertight. Do not rely on tile and setting bed for water proof qualities.
  - .10 Moisture and alkalinity:
    - .1 Prior to performing Test 2, test for moisture vapour transmission in accordance with ASTM F710-11 and ASTM F1869-16 or ASTM F2170-16a in accordance with manufacturer's written flooring installation instructions. Results must not exceed 170  $\mu\text{g}/\text{m}^2$  (3 lb per 1,000  $\text{ft}^2$ ) in 24 hours when tested to ASTM F1869-16, or exceed 75% when tested to ASTM F2170-16a.

Swimming Pool Tanks and Decks

---

- .2 Test for surface pH. Levels shall not exceed 9 pH. Test in accordance with ASTM F710-11.
- .3 For each test type: Conduct 3 tests for areas up to 100 m<sup>2</sup> (1000 ft<sup>2</sup>), and conduct 1 additional test for each additional 100 m<sup>2</sup> (1000 ft<sup>2</sup>) of flooring area.
- .2 Test 2:
  - .1 Fill pool as per Initial Start-up instructions.
  - .2 Follow pool water level monitoring procedures of Test 1 as outlined above.
  - .3 Drain pool if there is evidence of leakage.
  - .4 Locate and repair leakage, if any, as required and directed by the *Consultant*. Retest until pools are watertight.
- .3 A calibrated Water Loss Sensor, such as the Leakalyzer by Anderson Manufacturing, may be used in lieu of a control bucket. Submit proposed testing procedures to the *Consultant* for review.
- .4 Water costs:
  - .1 The cost of water required for the initial leak tests as well as any fillings or partial Fillings resulting from required repair work are included in the *Contract Price*.

### 3.11 Start-Up

- .1 Start-up equipment, balance equipment, and furnish necessary starting chemicals, in consultation with *Owner*, as required to bring water's chemical characteristics into proper balance.
- .2 Maintain the chemical balance of the pool water (including the cost of all chemicals required) until the pool and mechanical system is fully operational and accepted by the *Consultant* and the *Owner*.
- .3 Provide to the *Owner* sufficient quantities of the necessary chemicals to maintain the pools operation for a minimum of 30 days from the date of *Substantial Performance of the Work*.
- .4 Provide the *Owner* with a list of necessary chemicals 60 days prior to filling of the pool complete with estimated monthly quantities.
- .5 Provide chemicals required for subsequent treatment of water to achieve chemical treatment standards outlined below, until take-over by *Owner* at date of *Substantial Performance of the Work*.
- .6 Initial fill:
  - .1 Fill pool tank at rate of 25 mm (1") per hour.
  - .2 Water temperature shall match the temperature of the pool tanks to prevent thermal shock to the concrete and finishes.

### 3.12 Chemical Treatment of Water

- .1 While the pools are being filled, water shall be treated during complete filling process to bring water to the following recommended levels, including supply and installation of necessary chemicals to adjust and balance water chemistry in the pools to these levels:

Swimming Pool Tanks and Decks

---

- .1 Free available chlorine: 1.5.
- .2 Combined chlorine:  $\leq 0.2$ .
- .3 pH: 7.5.
- .4 Calcium hardness: 250 – 350 ppm.
- .5 Total alkalinity: 90 – 110 ppm.
- .6 Saturation index between -0.3 and +0.3.
- .2 Regularly monitor above levels during filling process and add chemicals as required throughout filling process to maintain these values. Ensure that water is properly treated during filling of pool to prevent damage to pool finish.
- .3 Monitor and verify fill water is balanced with a saturation index between -0.3 and +0.3.
- .4 Prior to initial filling of swimming pools, swimming pool contractor shall conduct the following water tests on the source of water, and correct the amount of chemicals to be added during the filling process:
  - .1 Chlorine - Free and combined (ppm).
  - .2 Total Alkalinity (ppm).
  - .3 pH.
  - .4 Iron (ppm).
  - .5 Copper (ppm).
  - .6 Calcium hardness.
  - .7 Total dissolved solids.

**3.13 Closeout Activities**

- .1 At a time to be identified by *Consultant*, during the initial fill and start-up of the system, provide instruction in maintenance and operations of pool filtration systems.
- .2 Each item of equipment and controls shall be operated for *Owner's* representatives to ensure an understanding of equipment functions, function of individual working parts, and location of valves and controls. Instruction shall deal with regular filter cycle, back-wash cycle, and emergency shut down.
- .3 Verify sequence of operation for each operational mode. Instruction shall also include advice on the maintenance of each item of equipment.
- .4 Training period shall be a minimum of 24 hours (total) conducted at the *Place of the Work* and as follows:
  - .1 Initial training: 16 hours minimum.
  - .2 Follow-up training:
    - .1 8 hours, minimum, after *Owner's* staff has had 2 weeks experience operating the systems.
    - .2 8 hours, minimum, 4 weeks after 2nd training session.

Swimming Pool Tanks and Decks

---

- .5 Videotape training session and/or arrange taping sessions with major suppliers, such as filtration system, chemical feeders, and water level controller. Staff to be trained in general maintenance and operation procedures. Submit a DVD copy of the training sessions to the *Owner* upon completion of training sessions.

**3.14 Adjusting and Cleaning**

- .1 Clean exposed and semi-exposed surface. Touch-up finishes to restore damaged and soiled areas.
- .2 Refer also to cleaning requirements specified under Section 13 11 20.

**3.15 Protection**

- .1 Protect and maintain conditions necessary to ensure that pools, decks, and equipment will be without damage or deterioration at date of *Substantial Performance of the Work*.
- .2 Refer also to protection requirements specified under Section 13 11 20.

**END OF SECTION**

Swimming Pool Tanks Meeting Agenda

---

**PART 1 – GENERAL**

**1.0 Administrative Requirements**

- .1 Read and be governed by conditions of the Contract and sections of Division 1.

**1.1 Pre-Installation Meeting:**

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19, except that pre-installation meeting for the work of this section shall occur at least 2 months prior to commencement of the work of this section at the *Place of the Work*.

**1.2 Related Sections:**

- .1 03 10 00 Concrete Formwork
- .2 03 15 20 Integral Crystalline Waterproofing
- .3 03 20 00 Concrete Reinforcement
- .4 03 30 00 Cast-in-Place Concrete
- .5 13 11 13 Swimming Pool Tanks and Decks
- .6 13 11 20 Swimming Pool Waterproofing and Tiling
- .7 13 11 21 Pool Tiling Schedule
- .8 13 11 46 Swimming Pool Accessories
- .9 13 11 47 Pool Accessories Schedule

Swimming Pool Tanks Meeting Agenda

**1.3 Agenda:**

	Agenda Item	Discussion
<b>1.0</b>	<b>General</b>	
1.1	Role of Pool Contractor	Review role of Pool Contractor.
1.2	Schedule of Submissions: – Shop Drawings – Mix Design – Samples	Reviewed list of required submittals based on the requirements of the Specifications.
1.3	Construction Schedule	Review construction schedule.
1.4	Testing and Inspection	Confirm T & I procedures and sample quantities. T & I agency to verify all concrete mix tickets on site. T & I agency to monitor pressure testing of embedded piping.
<b>2.0</b>	<b>Pool Tank Design and Coordination</b>	
2.1	Pool Waterproofing: Primary and Secondary waterproofing.	Concrete pool tanks are designed to be waterproof prior to the application of additional waterproofing membranes. Refer to ACI 350 Committee recommendations for watertight structures. Crack control (shrinkage and temperature of steel) governs the slab and wall design. As a minimum provision, reinforcement is recommended at a 0.5% reinforcement ratio and a maximum rebar spacing of 300 mm. . For 600 mm walls, 20M @200 each face fulfills the ACI recommendations.  Refer also to paragraph 6.0 Movement Joints.  Review testing for watertightness (13 11 13): Two waterproofing tests are specified for the pool tank.  Integral Crystalline Waterproofing (03 15 20) is referenced in the Division 13 specifications as the primary waterproofing. Secondary waterproofing membranes (13 11 20) are specified at locations where pool deck is constructed over and occupied space (i.e. service spaces).
2.2	Performance and Design Requirements	13 11 13 – Swimming Pool Tanks and Decks. Review and confirm requirements. Identify and document any required revisions.
2.3	Pool Tank Materials	13 11 13 – Swimming Pool Tanks and Decks. Review and confirm requirements. Identify

Swimming Pool Tanks Meeting Agenda

		and document any required revisions.
2.4	Fabrication Tolerances and Surveying.	13 11 13 – Swimming Pool Tanks and Decks. Review and confirm requirements.
2.5	Pool Tank Installation.	13 11 13 – Swimming Pool Tanks and Decks. Review and confirm requirements. Identify and document any required revisions.
2.6	Pool Equipment Installation: Itemized review of specifications.	13 11 13 – Swimming Pool Tanks and Decks. Review and confirm requirements. Coordinate with Divisions 26, 27, and 28. Review grounding procedures. Identify and document any required revisions.
2.7	Pool Accessories Installation: Itemized review of specifications.	13 11 13 – Swimming Pool Tanks and Decks. Review and confirm requirements. Review grounding procedures.
<b>3.0</b>	<b>Concrete</b>	
3.1	Concrete Mix Design. Confirm the following:  Exposure Class: _____  Strength: _____  Max W/C ratio: _____  Air Content: _____  Slump: _____	Concrete mix is specified in the Structural Concrete Notes.
3.2	Concrete Additives: Pool Tank Waterproofing (Primary Waterproofing)	Integral Crystalline Waterproofing is specified in 03 15 20. Refer also to 03 30 00 and 13 11 13.
	Concrete Admixtures:	03 30 00 – Cast-in-Place Concrete. Review recommendations for any additional admixtures.
<b>4.0</b>	<b>Concrete Formwork:</b>	
4.1	Form sequencing.	Review form setting sequence. Discuss recommended forming sequence to permit cast-in pool fixtures to be installed in the correct locations in the pool walls (pool side first).

Swimming Pool Tanks Meeting Agenda

4.2	Concrete form release agents.	Identify products and confirm that they are compatible with pool tile finishes.
4.3	Water stop details.	Review locations between at joints between pool walls and pool floors, and between pool walls and pool deck. PVC waterstop requirements are specified in 03 15 20, 03 10 00 and 13 11 13. Waterstops are installed on the wet side of the rebar and generous concrete cover is provided to ensure adequate space. Waterstop joints are required to be welded.
4.4	Sleeve types and sleeve water stops.	Review pipe sleeving procedures, products, and methods. Review locations of manufactured products (Link-Seal) and flange seals.
4.5	Corrosion resistant form ties.	Protection against rusting of ties is required. There are a number of ways to accomplish this (non-ferrous ties, deep cones and patching, etc.). Confirm products and review procedures. Form ties within 25 mm of the finished concrete surface must be corrosion resistant.
4.6	Contamination of concrete surfaces during construction of the pool.	Review procedures, products, and methods to prevent contamination.
4.7	Pool fixture coordination.	Review and identify required blockouts for pool fixtures. Review the forming sequence to permit cast in pool fixtures to be installed in the correct locations in pool walls. Coordinate the installation of pool fixtures in pool floors and walls to ensure that all fittings are flush with the final tile finish. Review grounding requirements.
4.8	Pool piping coordination.	Review and confirm piping that is embedded in pool floors and walls. Review pressure testing and reporting procedures.
<b>5.0</b>	<b>Concrete Reinforcement</b>	
5.1	Reinforcement – Concrete Cover	Reinforcement is placed so that rebar will not be exposed to chlorides and cause rust in the future. Details indicate 75 mm cover to vertical bars in walls and 60 mm cover to top bars in slabs. As the walls are typically 600 thick or more, this cover has nominal effect on their design
5.2	Reinforcement – Splicing.	Review procedures, products, and methods at pool floor to wall joints. Discuss use of "form saver" rebar splicing systems.
5.3	Reinforcement – Grounding loop.	Review procedures to tie-in rebar to pool grounding loop.

Swimming Pool Tanks Meeting Agenda

<b>6.0</b>	<b>Movement Joints</b>	
6.1	Movement joints – General.	Temperature and shrinkage reinforcement for watertight structures are guided by the ACI 350 Committee publication for watertight structures; the temperature and shrinkage reinforcement is based on providing a movement joint at 12 m (40 ft.) maximum span. Movement joints are continuous through the slab and bounding side walls. Review requirements for sliding stainless steel dowels and purpose made waterstops at movement joints, and hydrophilic waterstop at gutter perimeter.
6.2	Movement joints – Coordination.	Movement joints will be carried through to the pool tile finish. Joints must be straight (for later alignment with tile joints) and joint filler products must be compatible with pool tiling products.
<b>7.0</b>	<b>Concrete Patching Procedures</b>	
7.1	Concrete Patching Procedures - General	Review concrete patching procedures (03 30 00). Review form tie plugging procedures, products, and methods. Both sides of the pools wall are required to be patched. Epoxy bonding / grouting adhesive (Sikadur) and non-shrink grout (CPD).
<b>8.0</b>	<b>Curing Procedures</b>	
8.1	Curing Procedures – General	Review concrete curing procedures. Moist cure for fourteen (14) days (03 30 00).
<b>9.0</b>	<b>Water Blasting Procedures</b>	
9.1	Water Blasting Procedures - General	Review concrete water blasting procedures (13 11 13 and 13 11 20). Waterblasting is required to prepare the concrete for tiling membrane and/or tiling adhesive.  Waterblasting should take place before the 1 <sup>st</sup> watertightness test. A by-product of waterblasting is that it removes the top neutralized surface of carbonated concrete and exposes the internal concrete which has a typical pH level of 12. The watertightness test (i.e. filling the pool tank with water for 48 hours) helps to dilute the pH level of the exposed concrete and moves it closer to neutral.  Note that a surface pH level of 9 or less is required prior to application of waterproofing membranes or tile adhesives.
<b>10.0</b>	<b>Water Testing Procedures</b>	
10.1	Water Testing Procedures - General	Review concrete watertightness testing procedures (13 11 13).

Swimming Pool Tanks Meeting Agenda

<b>11.0</b>	<b>Safety Barricades</b>	
11.1	Safety Barricades - General	Review requirements for safety barricades. Note that barricades are required during water testing.
<b>12.0</b>	<b>Coordination with Divisions 22, 23, 26, 31, and 33.</b>	
12.1	Coordination - pool slabs.	Review and coordinate requirements of other Divisions. Review requirements at pool floor slabs, including rough grading and fill, drain boxes and pool inlets (and associated piping), under-slab and perimeter subdrainage, etc.
12.2	Coordination - pool walls.	Review and coordinate requirements of other Divisions. Review requirements at pool walls slabs, including mechanical piping and equipment, embedded pool lighting, and grounding. Coordinate placement of gutter air exhaust systems where indicated.
12.3	Coordination – deck slabs.	Review and coordinate requirements of other Divisions. Review requirements at pool deck slabs. Coordinate placement of floor drains and associated piping.

**END OF SECTION**

Swimming Pool Tiling

---

## **PART 1- GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Hard surface tiling for pool tanks and decks, including trim accessories.
  - .2 Waterproofing (secondary waterproofing) under indicated tile assemblies.
  - .3 Trim accessories.
  - .4 The work of this section forms an integral part of the work of Section 13 11 13.

### **1.2 Administrative Requirements**

- .1 Read and be governed by conditions of the *Contract* and sections of Division 1.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19 and Section 13 11 14.
- .3 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.

### **1.3 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00 and in conjunction with submittals specified under Section 13 11 13.
- .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 instructions for *Products* proposed for use in the work of this section.
- .3 Shop drawings:
  - .1 Indicate location of expansion and control joints.
  - .2 Coordinate preparation of shop drawings with preparation of shop drawings specified under Section 13 11 13.
- .4 Samples:
  - .1 Submit 3 -full size samples of each type of tile specified.
  - .2 Submit 3 - 305 mm (12") long samples trim accessory.
  - .3 Submit individual sample panels of each colour of porcelain tile, set with adhesive, grouting and bonding method as specified, showing quality, colour and finish of material, grout and pattern of tiles.
  - .4 Minimum size of each panel to be 600 mm x 600 mm (24" x 24").
- .5 Tiling system manufacturer's system warranty and design criteria:

## Swimming Pool Tiling

---

- .1 Submit tiling system manufacturer's warranty specimen and warranty design criteria prior to the commencement of work of this section.

### 1.4 Closeout Submittals

- .1 Submit closeout submittals in accordance with Section 01 77 00 and in conjunction with closeout submittals specified under Section 13 11 13.
- .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 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.

### 1.5 Quality Assurance

- .1 Qualifications:
  - .1 Installers / applicators / erectors: in accordance with Section 13 11 13, and as follows:
    - .1 *Subcontractor* 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 Non-grouted mock-up: 1220 mm x 1220 mm (48" x 48") area for each type and colour, texture, size, and pattern of tile.
  - .3 Install each product and colour mock-up for acceptance by *Consultant*. Accepted mock-up shall form basis of standard of workmanship for remainder of work. Mock-up shall consist of floor/wall/base corner intersection, with 300 mm (12") of finish product on each face.

### 1.6 Field Conditions

- .1 Execute work of this section while temperature is maintained within safe working temperatures in accordance with manufacturer's installation instructions for a period of 72 hours before, during and following installation. Avoid concentrated or irregular heating during curing period.
- .2 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.

### 1.7 Warranty

- .1 Tiling system (waterproofing, mortar and setting materials, grout, and tile) manufacturer's system warranty including the following:

Swimming Pool Tiling

---

- .1 Labour, materials, and workmanship 15 year system warranty.

## **PART 2 – PRODUCTS**

### **2.1 General**

- .1 Single source responsibility:
  - .1 In any given space, use adhesive and grout from a single manufacturer.
  - .2 In locations requiring waterproofing under tiled assemblies, adhesive and grout shall be of same manufacturer as waterproofing.
  - .3 Tile products shall be from same production run, dye lot, calibre, and batch number. If shading variation is evident, notify *Consultant* prior to installation.

### **2.2 Tile Products**

- .1 Acceptable *Products*:
  - .1 Refer to Section 13 11 21 Pool Tiling Schedule for specific tile *Products*.
- .2 Specialty Tiles:
  - .1 *Provide* specialty tiles for external and internal corners, angles and coved bases.
  - .2 *Provide* nosing, stretcher and cove tiles to match size, colour and finish of adjacent tiles, unless otherwise indicated.

### **2.3 Adhesive, Mortar, and Grout Materials**

- .1 Acceptable manufacturers (basis of design):
  - .1 Laticrete International, Inc.
  - .2 Mapei.
  - .3 Refer to Adhesive, Mortar, and Grout Materials schedule for specific acceptable *Products*.
- .2 For tile installations on sheet waterproofing membrane: Refer to paragraph 2.4 of Section 13 11 20 – “Sheet Waterproofing Membrane Materials”.
- .3 Primer: Low VOC, low viscosity primer as recommended by manufacturer to suit substrate and site conditions.
- .4 Fortified Mortar Bed and Levelling Coat:
  - .1 To ANSI A118.7 (ANSI A108/A118/A136.1-2013).
  - .2 Acceptable *Products*:
    - .1 Laticrete 3701 Fortified Mortar Bed.
    - .2 Mapei Mapecem 202.
    - .3 Substitutions: in accordance with Section 01 25 00.
- .5 Self Levelling and Smoothing Underlayment:
  - .1 Cementitious self levelling smoothing underlayment meeting or exceeding requirements of ANSI A108.1 (ANSI A108/A118/A136.1-2013), Type 2.

## Swimming Pool Tiling

---

### .6 Wall tile systems:

- .1 Thin Set and Medium Set Interior system: to ANSI A118.1 (ANSI A108/A118/A136.1-2013) and ANSI A118.4 (ANSI A108/A118/A136.1-2013).

### .7 Floor tile systems:

- .1 Thin Set and Medium Set Interior system: to ANSI A118.1 (ANSI A108/A118/A136.1-2013) and ANSI A118.4 (ANSI A108/A118/A136.1-2013).

### .8 Epoxy Grout:

- .1 Water cleanable, chemical resistant, factory blended modified Portland cement compound with epoxy additives and hardeners to ANSI A118.3 (ANSI A108/A118/A136.1-2013).

### .9 Grout colours to later selection by *Consultant* from manufacturer's full range.

### .10 Grout sealer: as recommended by grout manufacturer.

## 2.4 Sheet Waterproofing Membrane Materials (Secondary Waterproofing)

### .1 Waterproof membrane locations and extents: as indicated.

### .2 Waterproofing membrane:

- .1 Thin, flexible, liquid or trowel applied, load bearing waterproofing system. Membrane materials meet or exceed ANSI A118.10 (ANSI A108/A118/A136.1-2013) and ANSI A118.12 (ANSI A108/A118/A136.1-2013) and IAPMO certificate of listing as a shower pan liner. Materials to be non-toxic, non-flammable, and non-hazardous during storage, mixing, application and when cured.

### .2 Accessories:

- .1 Reinforcing fabric to be non-woven rot-proof specifically intended for waterproofing membrane as recommended by waterproofing manufacturer.
- .2 Mortar; for setting tile: Compatible product as recommended by waterproof membrane manufacturer.

### .3 Acceptable *Products*:

- .1 LATICRETE 9235 Waterproofing Membrane as manufactured by LATICRETE International, Inc.
- .2 Mapei 'Mapelastic 315'.
- .3 Substitutions: in accordance with Section 01 25 00.

## 2.5 Accessories and Related Materials

### .1 Trim accessories:

- .1 For tile edging at movement joints:

### .1 Basis of design:

- .1 Schluter 'DILEX-HKW'.

### .2 Joint sealants: mildew resistant sealant in accordance with Section 07 92 00 or as recommended by waterproofing membrane and grout manufacturer.

## Swimming Pool Tiling

---

.3 Prefabricated movement and control joints:

.1 Basis of design:

- .1 Schluter 'DILEX-BWS'.

### 2.6 Flexible Cementitious Waterproofing Membrane

.1 Applied flexible waterproofing membrane, at pool gutters and surge tanks coating:

.1 Acceptable *Products*:

- .1 Aquafin-2K/M cementitious, acrylic emulsion based waterproofing membrane; colour to later selection by the *Consultant* from the manufacturer's full range.

- .2 BASF 'MasterSeal 581' waterproof cement-based coating.

.2 Substitutions: in accordance with Section 01 25 00.

.3 Include all necessary primers and fillers as required.

### 2.7 Mixes

- .1 Mix premanufactured mortars and grouts in accordance with referenced standards, and mortar and grout manufacturer's written instructions.

## PART 3 - EXECUTION

### 3.1 General

- .1 Coordinate examination, preparation, and installation of pool waterproofing and tiling systems specified in this section with work of Section 13 11 13, including inspection and testing sequences and procedures.

### 3.2 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 instructions and in ANSI A108.5 (ANSI A108/A118/A136.1-2013) 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.

### 3.3 Preparation

- .1 General:

Swimming Pool Tiling

---

- .1 Ensure surfaces are dimensionally stable, cured free of contaminants such as oil, sealants and cured compound. Ensure concrete cures for a minimum of 90 days with a steel trowel and fine broom finish for thin set applications and a screed finish for mortar bed applications.
- .2 Prepare substrates in accordance with adhesive / waterproofing system manufacturer's instructions.
- .3 Prime concrete with primer, brush or roller applied at full strength in accordance with adhesive / waterproofing system manufacturer's instructions
- .2 Floor surfaces (pool decks and pool tanks):
  - .1 Prepare substrate in accordance with adhesive manufacturer's instruction, and prepare concrete with ultra high-pressure water blast (30,000 to 40,000 psi) to International Concrete Repair Institute (ICRI) designation CSP-3.
  - .2 Ensure all areas to be tiled and/or waterproofed have manufacturer's recommended moisture and alkalinity content prior to application. Record and document moisture alkalinity content and forward to *Consultant*.
  - .3 Remove dust, dirt, oil, grease, paint, laitance, efflorescence, curing compounds, sealers, water repellents and other materials that prevent bond. Metal plumbing pipe penetrations and fixtures must be clean of oil, grease, rust and other potential bond breakers.
  - .4 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion or performance or may act as bond breaker.
  - .5 Wire brush steel substrates to remove deleterious substances and rust, to promote full adhesion to steel.
  - .6 Concrete shall be minimum of 90 days old.
  - .7 Where substrate varies beyond the limits of the following:
    - .1 Mortar bed application substrate surface variation greater than 6 mm in 3000 mm (1/4" in 10'), apply levelling underlayment.
    - .2 Thin set application substrate surface variation greater than 3 mm in 3000 mm (5/16") thickness, apply levelling underlayment. Above 8 mm (5/16") correct irregularity by mortar bed method.
  - .8 Levelling Underlayment:
    - .1 Where substrate varies beyond limitations, prime substrate, mix and apply underlayment in accordance with manufacturer's instructions.
- .3 Wall surfaces (pool tanks):
  - .1 Rout out all construction joints and visible cracks exceeding 6.4 mm (1/4") in size to minimum 19 mm (3/4"). Remove all cement scum, dirt, duct and thoroughly rinse with water all concrete slab surfaces.
  - .2 Clean out all shrinkage cracks, tie holes, construction joints, and 'bug' holes and fill with an approved bonding compound.
  - .3 Prepare concrete with ultra high-pressure water blast (30,000 to 40,000 psi) to International Concrete Repair Institute (ICRI) designation CSP-3.

### Swimming Pool Tiling

---

- .4 Ensure all areas to be tiled and/or waterproofed have manufacturer's recommended moisture and alkalinity content prior to application. Record and document moisture alkalinity content and forward to *Consultant*.
- .5 Ensure that surface areas shall have an open capillary system to assure permanent bonding of the application.
- .6 Remove all form scale, oil, form release agents and any other foreign materials likely to affect bond, penetration and performance of the adhesive / waterproofing.
- .7 Use waterproofing mortar mix to create coves where horizontal and vertical surfaces meeting and on inside corners and for grouting in inserts and other protrusions.

#### 3.4 Mixing

- .1 Mix mortars, additives and grouts in accordance with manufacturer's requirements.
- .2 Rotating blade mechanical mixer: Pour latex additive, start mixer and add sand first, followed by Portland cement. Mix no mortar in same mixer as a dissimilar type of mortar unless the mixer is first thoroughly washed clean.
- .3 Pail batch mixing with low revolution drill mixers as follows:
  - .1 Premix separately prior to adding to the latex additive.
  - .2 Pour latex additive into clean mixing vessel and add dry materials slowly while mixing into a homogeneous and smooth consistency.

#### 3.5 Installation - General

- .1 Install products in accordance with manufacturer's specifications and as indicated herein.
- .2 Install in accordance with TTMAC Specification Guide 09 30 00 Tile Installation Manual TTMAC 2012-2014 Specification Guide 09 30 00, Tile Installation Manual, except where specified otherwise.
- .3 Install in accordance with ANSI A108.5 (ANSI A108/A118/A136.1-2013) and ANSI A108.10 (ANSI A108/A118/A136.1-2013).
- .4 Make joints even, straight, plumb and of uniform width.
- .5 Provide mortar beds and levelling coats in accordance with TTMAC details.
- .6 At floor deck drains, install slopes to drains as required by applicable codes and regulations, authorities having jurisdiction, and as indicated and watertest before tile installation.
  - .1 Ponding of water on pool deck is unacceptable. Areas where ponding occurs shall be removed and reinstalled.
- .7 Provide edge protection at tile edges and corners, unless otherwise indicated, using maximum length pieces.
- .8 Provide edge protection and transition strips at tile transitions, unless otherwise indicated, using maximum length pieces.
- .9 Review locations of tile accessories with *Consultant* prior to setting tile and comply with directions of *Consultant*.

## Swimming Pool Tiling

---

- .10 Lap tile and seal with sealant at inside corners. Caulk around pipes and openings made in tile with sealant.

### **3.6 Sheet Waterproofing Membrane Installation (Secondary Waterproofing)**

- .1 Install waterproof membrane to locations as indicated or scheduled to provide watertight performance.
- .2 Install waterproofing to comply with ANSI A108.13 (ANSI A108/A118/A136.1-2013) and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- .3 Work waterproofing membrane into adhesive with a flat trowel to achieve full contact and to remove air pockets.
- .4 Install prefabricated corners at outside and inside corner conditions.
- .5 Install prefabricated pipe collars at penetrations.
- .6 Install waterproofing strips at corner conditions at change in substrate plane conditions and where required by manufacturer's installation instructions.
- .7 Provide strips of waterproofing where required to span expansion joints or terminate waterproofing into movement joint type tile setting accessories, in accordance with manufacturer's instructions.
- .8 Seal waterproofing at penetrations and terminations in accordance with manufacturer's installation instructions.

### **3.7 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 Line up joints between tile installed on stairs from tread to tread.
- .6 Except where tiles have setting tabs, and except for expansion, control and isolation joints, maintain joint widths as selected by *Consultant*.
- .7 Back up tile coves, curbs and other shaped pieces solid with mortar. Rigidly set, reinforce or otherwise make firm and secure such pieces.
- .8 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 all tiles with voids in setting bed.
- .9 Tile shall contact setting materials for minimum of 95% coverage unless otherwise indicated.
- .10 Obtain 100% mortar coverage with applicable requirements for back buttering of tile in referenced TTMAC and ANSI A108/A118/A136.1-2013 series of tile installation standards.

### Swimming Pool Tiling

---

- .11 Remove any excess setting material from the joint area so that 2/3 of the depth of the tile is available for grouting.
- .12 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.
- .13 Do necessary cutting and drilling of fixtures, fittings, and built-in or penetrating units without marring the tile. Replace all cracked or damaged tile.
- .14 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.
- .15 Install tiles to provide even distribution of shading, colour, and characteristics.

#### **3.8 Mortar-Bed Tiling**

- .1 Apply latex-Portland cement thin bed mortar with flat trowel as a slurry bond coat approximately 1.5 mm (1/16") thick over clean concrete slab.
- .2 Place latex-Portland cement thick bed mortar over slurry bond coat while bond coat is wet and tacky. Omit reinforcing wire fabric and fully compact bed by tamping.
- .3 Spread latex-Portland cement thin bed mortar with flat trowel over surface of "green"/fresh mortar bed as a slurry bond coat approximately 1.5 mm (1/16") thick.
- .4 Apply latex-Portland cement thin bed mortar slurry bond coat to back of tile or threshold and place each piece/sheet while slurry bond coats are wet and tacky. Beat with a hardwood block or rubber mallet to level/imbed pieces before mortar bed takes initial set.
- .5 Clean excess mortar from finished surfaces.
- .6 For installation of tile over cured (pre-floated) latex-Portland cement thick bed mortar, follow Thin-Set Method.

#### **3.9 Thin-Set Method**

- .1 Use the appropriate trowel notch size to ensure full bedding of the tile.
- .2 Work the thin-set mortar into good contact with the substrate and comb with notched side of trowel.
  - .1 Flat trowel thin-set mortar to consistent thickness for glass tile installations.
- .3 Beat each piece/sheet into the thin-set mortar with a beating block or rubber mallet to insure full bedding and flatness.
- .4 Clean excess thin-set mortar from tile face and joints between pieces.
- .5 Do not cover, bridge or fill tile joints located over expansion joints with adhesive.

#### **3.10 Control and Movement Joints**

- .1 Carry substrate control and movements joints through to tile work.
- .2 Install control joints around the perimeter of tiled areas, around columns and where tile abuts other hard materials.
- .3 Cut tiles on both sides along the edges of control or movement joints.

### Swimming Pool Tiling

---

- .4 Provide control joints in floors and walls at perimeters of floor and within 4800 mm to 6100 mm (16 ft to 20 ft) centre to centre by raking out joints to full depth of tile and cleaning joints for application of sealant in accordance with Section 07 92 00. In areas subject to sunlight provide control joints within 2400 mm to 3700 mm (8 ft to 12 ft) centre to centre.
  - .1 Review locations with *Consultant* prior to setting tile and comply with instruction given by *Consultant*.
- .5 Control joint width: 6.4 mm (1/4") minimum, unless indicated otherwise.

#### **3.11 Trim Accessories Installation.**

- .1 Coordinate transitions with work of other sections.
- .2 Install trims in accordance with manufacturer's installation instructions.
- .3 Install in continuous lengths.
- .4 Scribe and fit to obstructions.
- .5 Cope mitre corners.

#### **3.12 Grouting or Pointing**

- .1 Apply grout in accordance with manufacturer's printed instructions.
- .2 Chemical resistant, water cleanable tile-grouting epoxy (ANSI A118.3 (ANSI A108/A118/A136.1-2013)):
  - .1 Allow tile installation to cure a minimum of 24 hours at ambient temperature of 21°C prior to grouting.
  - .2 Install chemical epoxy resistant grout in compliance with current revisions of ANSI A108.1 (ANSI A108/A118/A136.1-2013) and ANSI A108.10 (ANSI A108/A118/A136.1-2013).
  - .3 Verify grout joints are free of dirt, debris, water or tile spacers and face of tiles are clean.
  - .4 Apply grout release to face of absorptive, abrasive, non-slip or rough textured tile units that are not hot paraffin coated to facilitate cleaning.
  - .5 Spread using a sharp edged, hard rubber float and work grout into joints using diagonal strokes (45° angle).
  - .6 Pack joints full and free of voids/pits. Stroke diagonally to remove excess grout and to avoid pulling grout out of filled joints.
  - .7 Once excess grout is removed, begin cleaning grout haze approximately 20-30 minutes after grouting depending on temperature. Using a circular motion, lightly scrub grouted surfaces with the damp sponge to dissolve grout film/haze. Then drag sponge diagonally over the scrubbed surfaces to remove froth. Rinse sponge frequently and change cleaning solution at least every 4.7 m<sup>2</sup> (50 ft<sup>2</sup>). Discard sponges as they become "gummy" with residue.

### Swimming Pool Tiling

---

- .8 Within 1 hour of finishing first cleaning, clean the same area again following the same procedure but utilizing a clean white scrub pad and fresh cleaning solution. Rinse scrub pad frequently. Drag a clean sponge diagonally over the scrubbed surfaces to remove froth. Use each side of sponge only once before rinsing and change cleaning solution at least every 4.7 m<sup>2</sup> (50 ft<sup>2</sup>). Allow cleaned areas to dry and inspect tile surface. Rinse with clean water and allow surface to dry. Inspect grout joint for pinholes/voids and repair them with freshly mixed grout.
- .3 Grout joint width to be 3.2 mm (1/8") unless otherwise indicated.
- .4 Do not cover, bridge or fill any expansion joints in tile with grout.

#### 3.13 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 3000 mm (1/4" in 10 feet).

#### 3.14 Flexible Cementitious Waterproofing Membrane Installation Pool Gutters and Surge Tanks

- .1 Follow coating manufacturer's written instructions using compatible materials in quantities and techniques so recommended.
- .2 Examine all construction substrates and conditions under which waterproofing materials are to be installed. Do not proceed with the waterproofing application until unsatisfactory conditions are corrected.
- .3 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 waterproofing system.
  - .2 Substrate shall be sound, smooth and free from surface irregularities.
  - .3 Remove projections and other conditions which may affect installation of the waterproofing.
  - .4 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion or performance or may act as bond breaker.
  - .5 Prepare concrete surfaces by mechanical method approved by membrane manufacturer in accordance with International Concrete Repair Institute (ICRI) recommendations to achieve a CSP 3 profile. Thoroughly clean upon completion of operation. Substrate to be approved in writing by manufacturer prior to application of waterproof membrane.
    - .1 Submit written report to *Consultant* following procedures for manufacturer's field review in accordance with Section 01 45 00.
  - .6 Fill surface irregularities in substrates with appropriate repair materials and with methods as recommended by membrane manufacturer.

Swimming Pool Tiling

---

- .7 Rinse surfaces to be waterproofed (excluding drywall or similar) with clean water to saturated surface dry (SSD) condition, with no standing water on horizontal surfaces.
- .8 Perform adhesion tests for waterproofing to concrete substrate.
- .4 Installation:
  - .1 Prime concrete substrates as recommended by membrane manufacturer on prepared substrates in accordance with manufacturer's written instructions.
  - .2 Cavity fill, honeycombs & form tie holes: fill in accordance with membrane manufacturer's written instructions and recommendations.
  - .3 Tape construction joints and cracks in accordance with membrane manufacturer's written instructions and recommendations.
  - .4 Seal around penetrations in accordance with membrane manufacturer's written instructions and recommendations.
  - .5 Mix two-component waterproofing material in proportions recommended by manufacturer.
  - .6 Positive side waterproofing:
    - .1 Apply two-component waterproofing material in quantities and number of coats in accordance with membrane manufacturer's instructions and recommendations:
      - .1 Apply at 60 mils or 1.5 mm (1/16") total thickness for all standard applications and waterproofing up to 4000 mm (13 ft) water head.
      - .2 Apply at 2.0 mm - 2.4 mm (80 mils - 90 mils) total thickness for applications exposed to hydrostatic pressure (>4000 mm (>13 ft) water head), under tiles, plaza decks, and the like.
  - .7 Surface finish:
    - .1 Surge tank: Surface finish shall be standard (regular) two-component waterproofing material finish.
    - .2 Gutters: Surface finish shall be "smooth" by applying a top coating of 10 mils - 20 mils special smooth powder mix of two-component waterproofing material.

**3.15 Field Quality Control**

- .1 Refer to Section 13 11 13 for requirements for inspection and testing of pool installations: such requirements require participation and coordination with the work of this section.
- .2 Field tests and inspections:
  - .1 Adhesion bond test:
    - .1 Proceed with bond test after substrates have been prepared and alkalinity and moisture test have been completed.
    - .2 Adhesion bond test shall be completed in accordance with tile flooring and mortar and adhesive setting manufacturer's written instructions.

### Swimming Pool Tiling

---

- .3 Using the specified adhesive/mortar, set test tiles using adhesive/mortar manufacturer's recommended trowel.
- .4 After duration recommended by tile flooring and adhesive/mortar manufacturer, attempt to remove the test tiles by pulling up from the corners.
- .3 Manufacturer shall provide field review in accordance with Section 01 45 00.

#### **3.16 Adjusting and Cleaning**

- .1 Cleaning: Clean tile surfaces so they are free of foreign matter using manufacturer recommended cleaning products and methods after completion of placement and grouting and as follows:
  - .1 Remove grout residue from tile after grouting has cured.
  - .2 Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.
  - .3 Flush surface with clean water before and after cleaning.
- .2 Re-point joints after cleaning to eliminate imperfections.

#### **3.17 Protection**

- .1 Protection: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies as follows:
  - .1 Prohibit traffic during installation and for minimum 96 hours after installation.
  - .2 Protect finished areas from traffic until setting materials have sufficiently cured in accordance with TTMAC requirements.
  - .3 Protect floor areas from traffic after grouting is completed in accordance with manufacturer's written instructions.
  - .4 Prevent foot and wheel traffic from floors for a minimum of 96 hours after completion of grouting.
  - .5 Protect wall tiles and bases from impact, vibration, heavy hammering on adjacent and opposite walls for a minimum of 7 days after installation.
  - .6 Install floor protection in areas where other work, repairs and installation or equipment and foot traffic will occur. Lap joints of protective cover material by 150 mm and seal with non-asphaltic tape.

**END OF SECTION**

Pool Tiling Schedule

**1.0 Tiling Schedule:**

- .1 Tile:
  - .1 Daltile Keystone Unglazed Colorbody Porcelain Mosaics.
  - .2 American Olean Unglazed Ceramic Mosaics.
- .2 Trim:
  - .1 Specialty tiles: pool nosing (TL-PN), stretcher (TL-ST) and cove base (TL-CB) tiles to match size, colour and finish of adjacent tiles.
  - .2 Tile types specified include matching specialty tiles for internal and external corners, angles and cove bases.
- .3 Specialty Ideogram Tile: custom size 172 x 172
  - .1 Ceramic tile, beveled edge, with custom ceramic graphic safety markers.
    - .1 INLAYS Inc.

	Location	Size (mm)	Basis of Design Product	Finish	Colour
TL20	Pool Floors	50 x 50	American Olean Unglazed ColorBody	Standard	Ice White A25
TL21	Pool Entry Ramps, Pool Entry Steps, Slide Flume Steps	50 x 50	American Olean Unglazed ColorBody	Abrasive	Ice White A25
TL22	Pool Basin Walls	50 x 50	American Olean Unglazed ColorBody	Standard	Ice White A25
TL23	Pool Lane Markers & End Wall Targets	50 x 50	American Olean Unglazed ColorBody	Standard	Storm Gray A22
TL24	Pool Entry Ramp Markers	50 x 50	American Olean Unglazed ColorBody	Abrasive	Storm Gray A22
TL25	Seats in Pool Basins	50 x 50	American Olean Unglazed ColorBody	Standard	Ice White A25
TL26	Edges of seats, stairs and ledges in Pool Basins, Drains, Pool Inlets, Lazy River Grating	50 x 50	American Olean Unglazed ColorBody	Standard	Storm Gray A22
TL27	reserved				
TL28	reserved				
TL29	reserved				
TL30	Pool Edge Border	25 x 25	American Olean Unglazed ColorBody	Standard	Ice White A22
TL31	Deck Tile	50 x 50	American Olean Unglazed ColorBody	Abrasive	Storm Gray Speckled A06
TL32	Deck Markers	25 x 25	American Olean Unglazed ColorBody	Standard	Ice White A25
TL33	Deck Marker Field	25 x 25	American Olean Unglazed ColorBody	Abrasive	Storm Gray Speckled A06
<b>Notes</b>					
TL31	Includes mosaic cove base tile at walls.				
TL32 TL33	TL32 Numerals and letters from full and cut tiles set in TL33 field, as indicated.				

Pool Tiling Schedule

<b>TL35</b>	Benches, Aquatic Hall Niche Walls, Slide Tower Walls, Slide Tower Stringers, Raised Pool walls in Leisure Pool, Hot Tub and Lazy River (to water line)	25 x 25	American Olean Unglazed ColorBody	Standard	Ice White A25
<b>TL36</b>	Depth Markings at Benches, Signage at Slide Tower	25 x 25	American Olean Unglazed ColorBody	Standard	Storm Gray A22
<b>TL37</b>	Slide Tower Steps and Landings	25 x 25	American Olean Unglazed ColorBody	Abrasive	Ice White A25
<b>TL38</b>	Edges of Steps and Landings at Slide Tower	25 x 25	American Olean Unglazed ColorBody	Abrasive	Storm Gray A22
<b>TL40</b>	"DEEP WATER" inset ideogram tile	172 x 172	www.inlaysinc.com	Abrasive Skid Resistant	Background: Ice White A25 Print Colour : Gray A22
<b>TL41</b>	"NO DIVING" inset ideogram tile	172 x 172	www.inlaysinc.com	Abrasive Skid Resistant	Background: Ice White A25 Print Colour : Red Circle and diagonal line, black for person and water lines Gray A22
<b>TL50</b>	Aquatic Hall Walls	100mmx400mm	Centura International	Gloss	White 416G

Pool Tiling Schedule

**2.0 Adhesives, Mortar and Grout Materials Schedule**

	<b>Laticrete System</b>	<b>Mapei System</b>
<b>Slurry Bond Coat</b>	Laticrete 254 Platinum	Planibond EBA
<b>Thick Bed Mortar Leveling Coat (decks): Fortified Portland Cement</b>	Laticrete 3701 Fortified Mortar	Mapecem 202
<b>Mortar Leveling Coat (pool tanks): Fortified Portland Cement</b>	Laticrete 3701 Fortified Mortar	Vertical surfaces: Planitop 23 Horizontal surfaces: Mapecem 202
<b>Thinset Mortar (decks): Modified Portland Cement</b>	Laticrete 254 Platinum	Ultraflex 3 or Ultraflex RS
<b>Thinset Mortar (pool tanks): Modified Portland Cement</b>	Laticrete 254 Platinum	Granirapid or Kerabond / Keralastic
<b>Grout: Epoxy</b>	Laticrete SpectraLock PRO Grout	Kerapoxy
<b>Waterproofing Membrane</b>	Laticrete 9235 with mesh	Mapelastic 315 with mesh

**3.0 Tile Installation Schedule**

- .1 Install in accordance with TTMAC Specification Guide 09 39 99 Tile Installation Manual (latest edition).

	<b>Location</b>	<b>Waterproofing Membrane</b>	<b>Thick Bed Mortar Leveling Coat (over Slurry Bond Coat)</b>	<b>Thin-Set Mortar (Adhesive)</b>	<b>Grout</b>	<b>TTMAC Details</b>
.1	Pool Tanks	No	As required for leveling purposes	Modified Portland Cement	Epoxy	317SP
.2	Pool Deck slab on grade	No	Yes	Modified Portland Cement	Epoxy	310F
.3	Pool Deck over occupied areas (suspended slab)	Yes	Yes	Modified Portland Cement	Epoxy	310F
<b>Notes</b>						
	Pool Storage Rooms: Floor finishes contiguous with adjacent Pool Deck.					

**END OF SECTION**

## **PART 1- GENERAL**

### **1.1 Summary**

- .1 Section Includes
  - .1 Swimming pool accessories and pool gutter grates for supply and installation as part of the work of Section 13 11 13.

### **1.2 Administrative Requirements**

- .1 Read and be governed by conditions of the *Contract* and sections of Division 1.
- .2 Conduct a pre-installation meeting in accordance with Section 01 31 19 and Section 13 11 14.

### **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 manufacturers' installation instructions.
- .3 Shop drawings:
  - .1 Clearly indicate fabrication details, plans, elevations, hardware, and installation details.
- .4 Templates:
  - .1 Submit templates to *Contractor* for use by installers and fabricators as required for proper location and installation of hardware.

### **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 Include procedures for care and maintenance of stainless steel in Aquatics Hall.
- .3 Maintenance materials:
  - .1 Provide minimum 3 pieces of 3 metre length pool grating required for the *Work* for maintenance use.
  - .2 Maintenance material to be of same production run as installed material.

### **1.5 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors:

Swimming Pool Accessories

---

- .1 *Subcontractor* qualifications: in accordance with Section 13 11 13.

**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*.

**1.7 Warranty**

- .1 Warrant work of this section for a period of 5 years in accordance with Section 01 78 36.

**PART 2 - PRODUCTS**

**2.1 Performance/Design Requirements**

- .1 Regulatory requirements
- .2 Design, fabricate and install work of this section to requirements of the building code and other authorities having jurisdiction.

**2.2 Materials and Finishes**

- .1 Exposed ferrous metals: type 316L Stainless Steel (316L SST).
- .1 Factory applied anti-corrosion systems:
- .1 Passivation: in compliance with ASTM A967-99, incorporating organic passivation techniques for maximum corrosion resistance.
- .2 Protective coating: intra-granular protection.
- .2 Powder paint finished stainless steel (SST-Powder): type 316 stainless steel.
- .1 Shop applied powder paint systems:
- .1 Preparation: clean stainless steel in accordance with SSPC-SP6 – Commercial Grade Blast Cleaning or SSPC10 – Near White Blast Cleaning.
- .2 Base Coat: Epoxy zinc-rich primer, 3.5 – 4 mils thickness, bake cured.
- .3 Top Coat: TGIC polyester powder, 3.5 – 4 mils thickness, metallic finish, bake cured.
- .4 Clear Protection Coat: polyester powder, 1 -2 mils thickness, bake cured.
- .5 Minimum total thickness: 8 mils.

**2.3 Hand Rails, Grab Bars, and Guard Rails**

- .1 Basis of design manufacturer:
- .1 Spectrum Aquatics.
- .2 Acceptable alternate manufacturer:
- .1 Paragon Aquatics.
- .2 Aquam.
- .3 S.R. Smith.

### Swimming Pool Accessories

---

- .4 DB Perks & Associates.
- .5 Astral Pool.
- .6 Substitutions: in accordance with Section 01 25 00.
- .3 Rails:
  - .1 38 mm (1-1/2") outside diameter x 3 mm (0.120") wall thickness, ASTM-A-554 grade 316L stainless steel polished to No. 6/500 grit finish.
  - .2 Fully grind and polish smooth welded connections.
  - .3 Refer to drawings for required dimensions and configurations.

#### 2.4 Accessories

- .1 Basis of design manufacturer for manufactured stainless steel pool accessories:
  - .1 Spectrum Aquatics.
  - .2 Refer to Accessories Schedule for specific accessory *Products*.
- .2 Acceptable alternate manufacturers:
  - .1 Paragon Aquatics.
  - .2 DB Perks & Associates Ltd.
  - .3 Astral Pool.
  - .4 S.R. Smith.
- .3 Factory applied anti-corrosion systems:
  - .1 Passivation: in compliance with ASTM A967-99, incorporating organic passivation techniques for maximum corrosion resistance.
  - .2 Protective coating: intra-granular protection.

#### 2.5 Pool Gutter Grates

- .1 Pool gutter grates:
  - .1 Rigid swimming pool grating with grating bars running parallel to pool edge.
  - .2 Basis of design: Emco 'Swimming Pool Grating Model 723/725' as distributed by V.P. Tile Imports Ltd. Tel: 604-594-9902, or approved equal.
    - .1 Full profile 25 mm x 10 mm made from impact resistant plastic with UV absorbency; corrosion-free, resistant to chlorine, sea water and spa water; surface enclosed on all sides. round upper profile surface with safety profile seal (SPS); non-slip properties in accordance with DIN 51097; classification C.
    - .2 Connection: fibre-glass reinforced polyester pipes.
    - .3 Bar spacing: <8 mm.
    - .4 Grating height: 25 mm.
    - .5 Dimensions: as indicated.
    - .6 Corners: mitred.
    - .7 Frames: 25 mm x 38 mm PVC curb angle, locations as indicated.

Swimming Pool Accessories

---

.8 Colour:

.1 White.

.2 Pool gutter grate for slide runout:

.1 Basis of design: Emco Grate.

.2 Custom size: as indicated.

## **2.6 Deck Drains**

.1 Basis of Design: Zurn Z880 Perma-Trench, Linear High Density Polyethylene (HPDE) Modular Drain Channel with Polyethylene Grate, complete with bottom outlets.

## **PART 3 - EXECUTION**

### **3.1 Installation**

- .1 Install pool accessories in accordance with manufacturer's printed instructions.
- .2 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.
- .3 Metal within 3000 mm (118") of pool tank to be grounded in accordance with Divisions 26, 27, and 28.
- .4 Deliver items to be cast-in or incorporated in work of other sections and supervise installation of same.
- .5 Cooperate with *Owner's* representative and other contractors as they install equipment not included in the work of this section.
- .6 Install work to meet manufacturers' recommended specifications, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.
- .7 Include reinforcing, anchorage and mounting devices required for the installation of each *Product*.
- .8 Fit joints and junction between components tightly and in true planes, conceal and weld joints where possible.
- .9 Fabricate *Products* with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that swimming pool accessories will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.
- .10 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.

### **3.2 Stainless Steel Anti-Corrosion Procedures**

- .1 Field treat stainless steel fittings used in Aquatics Hall against corrosion prior to project turnover to the *Owner*.

Swimming Pool Accessories

---

- .1 Exposed ferrous metals: Type 316 stainless steel (316L SST).
- .2 Treat stainless steel with 2-step process as follows:
  - .1 Passivation incorporating organic passivation techniques.
  - .2 Treatment to protect intra-granular structure of steel against corrosion.
- .3 Standard of acceptance:
  - .1 'Spectrum System 1 Field Passivation' and 'Spectra-Shield' treatment by DB Perks & Associates Ltd.
- .4 Provide training to *Owner's* staff using field application techniques.

**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.

**3.4 Adjusting and Cleaning**

- .1 Clean exposed and semi-exposed surface. Touch-up finishes to restore damaged and soiled areas.

**3.5 Protection**

- .1 Protect and maintain conditions necessary to ensure that pools, decks, equipment, and accessories will be without damage or deterioration at date of *Substantial Performance of the Work*.

**END OF SECTION**

Pool Accessories Schedule

**PART 1 – GENERAL**

**1.0 General Notes**

- .1 Read in conjunction with Section 13 11 46 Swimming Pool Accessories.

**1.1 Pool Accessories:**

- .1 Basis-of-Design (where indicated):
  - .1 Spectrum Aquatics.
  - .2 Neptune Benson.
  - .3 Paragon Aquatics
  - .4 DB Perks & Associates Ltd.
  - .5 Duraflex International Corporation.
- .2 Alternative manufacturers:
  - .1 Aquam Aquatic Specialist, Astral Pool, S.R. Smith.
- .3 Materials for manufactured stainless steel pool accessories:
  - .1 Exposed ferrous metals: type 316L stainless steel (SST).
    - .1 Factory applied anti-corrosion systems:
      - .1 Passivation: in compliance with ASTM A967-99, incorporating organic passivation techniques for maximum corrosion resistance.
      - .2 Protective coating: Spectra-Shield intra-granular protection.
    - .2 Powder paint finished stainless steel (SST-Powder): type 316L stainless steel.
      - .1 Shop applied powder paint systems in accordance with Section 13 11 46 Swimming Pool Accessories.
- .4 Anchor kits:
  - .1 Stainless Steel (316L SST) anchor kits for chairs and platforms
- .5 Escutcheon plates:
  - .1 Provide escutcheon plates at anchor locations.
  - .2 Match material and finish of the associated rail or post.
  - .3 Escutcheons are not required at compressions anchors.
- .6 Safety Equipment mounting brackets and hooks:
  - .1 Provide necessary mounting brackets and hooks for safety equipment.

**1.2 Accessories Schedule:**

LAP POOL			
Item	Basis of Design	Material / Colour	Qty.
Grab Rails at cast-in steps	Spectrum rails and anchors	SST-Powder SST wedge anchors	4
Hand Rail at Ramp (submerged)	Spectrum rails	SST-Powder Grouted anchor	1
Hand Rail / Guardrail at Ramp	Spectrum rails	SST-Powder Grouted anchor	1

Pool Accessories Schedule

<b>LAP POOL</b>			
<b>Item</b>	<b>Basis of Design</b>	<b>Material / Colour</b>	<b>Qty.</b>
0.6 Metre Dive Stand	Spectrum 22123 Side Mount Dive Stand with Flip-up. Bronze wedge anchors	SST-Powder	1
Diving Board	Duraflex 14' Maxiflex Model B 66-231-324	Prefinished aluminum extrusion Confirm colour with <i>Consultant</i>	1
Fixed Lifeguard Chairs	Spectrum 44116 6ft. Stimson with anchor kit	SST-Powder	2
Backstroke Stanchion Posts (BS)	Spectrum 23614 8 ft. post c/w sliding collar and eye bolt	SST Bronze anchors with caps	2 pairs
False Start Stanchion Posts (FS)	Spectrum 23614 8' post with sliding collar and eye bolt	SST	1 pair
Stanchion Anchors (SA)	Spectrum 23638 Stanchion Anchor	Bronze anchors with caps	3 pairs
Backstroke Flagline	DB Perks or Paragon 300 mm x 450 mm pennants	Coordinate colours with <i>Consultant</i>	1
False Start Rope Line	DB Perks or Paragon	Coordinate with <i>Consultant</i>	1
Cast-in-place moulded steps	Paragon 32101	Injection moulded plastic with textured tread / White	3 sets
Cup Anchors (CA)	Spectrum 58316	Stainless Steel	6 pairs
Line Anchors (LA)	Neptune Benson Flip-up #11894	SST-Powder (white)	5 pairs
Lane Dividers	DB Perks 20 01 03 – 25 metre Forerunner 4.75 inch Lane Lines		5
Lane Rope Compartment (LRC)	Spectrum 47132 c/w tile inlay cover	SST-Powder, all components	5
Starting Platforms	Spectrum Record Breaker, dual post, 760mm reach 57741 with anchor kit.	SST-Powder.	6
Starting Platform Covers	Spectrum 21400	Polyethylene	6
Shallow End Lane Rope Floats	Commercial Aquatic Supply 18 03 01 – 25.8 metres	Provide Rope hooks and polyethylene rope as required	2
Climbing Wall	12'W x 16'H Clear Pool Climbing Wall by Spectrum (3 – 4' wide sections)	SST-Powder.	1
Climbing Wall anchors	Spectrum 24010 Wedge Anchor	Bronze anchors with caps	6
Rope Floats at Climbing Wall alcove	Commercial Aquatic Supply 18 03 01 – 7.8 metres	Provide Rope hooks and polyethylene rope as required	1
Swim Pace Clocks	Commercial Aquatic Supply Sanio 36" wall mounted clock		2
Ramp Gate	Breakaway Lane Closure Gate by Brascon Architectural Products Inc.	SST-Powder	1

<b>HOT TUB</b>			
<b>Item</b>	<b>Basis of Design</b>	<b>Material / Colour</b>	<b>Qty.</b>
Hand Rails at Stair	Spectrum rails	SST-Powder Grouted anchor	1 pair
Ramp Gate	Breakaway Lane Closure Gate by Brascon Architectural Products Inc.	SST-Powder	1

Pool Accessories Schedule

<b>WATER SLIDE ACCESSORIES</b>			
<b>Item</b>	<b>Basis of Design</b>	<b>Material / Colour</b>	<b>Qty.</b>
Ramp Gate	Breakaway Lane Closure Gate by Brascon Architectural Products Inc.	SST-Powder	1
Hand Rails and Guard Rails	Reference Division 05	Powder Coated Aluminum	

<b>LEISURE POOL</b>			
<b>Item</b>	<b>Basis of Design</b>	<b>Material / Colour</b>	<b>Qty.</b>
Grab Rails at cast-in steps	Spectrum rails and anchors	SST-Powder SST wedge anchors	2
Hand Rail at Ramp (submerged)	Spectrum rails	SST-Powder Grouted anchor	1
Hand Rail / Guardrail at Ramp	Spectrum rails and anchors	SST-Powder SST wedge anchors	1
Hand Rails at Stair (submerged)	Spectrum rails	SST-Powder Grouted anchor	2
Guard Rail at Stair	Spectrum rails and anchors	SST-Powder SST wedge anchors	1
Lane Rope Floats	Commercial Aquatic Supply 18 03 01 – 15.0 metres	Provide Rope hooks and polyethylene rope as required	2
Fixed Lifeguard Chair	Spectrum 44116 6ft. Stimson with anchor kit	SST-Powder	1
Cast-in-place moulded steps	Paragon 32101	Injection moulded plastic with textured tread / White	2 sets
Basketball Net	Spectrum Dual post 57827 with Stanchion Anchors 23638	SST-Powder coat Confirm colour with <i>Consultant</i> Provide companion caps	1
Ramp Gate	Breakaway Lane Closure Gate by Brascon Architectural Products Inc.	SST-Powder	1

<b>LEISURE POOL TOYS SCHEDULE</b>			
<b>Item</b>	<b>Basis of Design</b>	<b>Product</b>	<b>Qty.</b>
Belle Tower	Raindrop Products BLSJ-006-OM-S-ZCS	Belle Tower Omni Flow Rate 30 GPM @12' TDH	1
Sheet Flo	Raindrop Products Sheetflo Curtain 6N-Omnipod	Sheet Flo Curtain Omni Flow Rate 36.5 GPM @ 12' TDH	1
Popcorn Jet	Raindrop Products PKJT-003-OM	Mini Foam Geyser Feature Flow Rate 14.5-31 GPM @ 5' TDH	2
Slant Finger Jet	Raindrop Products SFJT-003-OM	Slant Finger Jet Omni Flow Rate 4.8-9.5 GPM @ 3' TDH	6
Slant Jet	Raindrop Products SLJT-003-OM	Slant Jet Flow Rate 3.8 GPM @ 3' TDH	6
Feature Adapter	Raindrop Products POD-A001	OMNIPOD Feature Adapter	16

Pool Accessories Schedule

<b>ACCESSIBILITY LIFT</b>			
<b>Item</b>	<b>Basis of Design</b>	<b>Product</b>	<b>Qty.</b>
Cast in place anchors for Owner supplied lift (Elkhorn Manual Powered Pool Lift)	Spectrum 28510	Lift Anchor kit	2

<b>SAFETY AND MAINTENANCE</b>			
<b>Item</b>	<b>Basis of Design</b>	<b>Product</b>	<b>Qty.</b>
Tiger Shark QC Cleaner	Aqua Vac 9990-CSA		2
Telescoping Pole	Recreonics 10-333	Heavy Duty Aluminum Telescoping Poles 12 ft. to 24 ft.	1
Telescoping Pole for Wall Brush and Leaf Net	Rainbow R191306	Telescopic Anodized Aluminum Pole 8 ft. to 16 ft.	1
Wall Brush	Rainbow R111316		1
Heavy Duty Skimmer	Rainbow R121196	Solid Aluminum Rod Deep Net on ABS Snap-on frame	1
Throw Ropes	Monarch-McLaren YR25-1	Yellow	4
Rescue Board with Head Immobilizer	Marie Rescue COMBO		1
Life Ring	Cal June 20"	Orange Soft Shell	2
Life Hook and Pole	Rainbow R221026 and R191095	Life Hook on Fibreglass Pole Extendable to 12ft.	1
AC/DC Audible / Visual Alarm with Emergency Stop	IDT Systems Inc.	As required.	

<b>VIEWING AREA</b>			
<b>Item</b>	<b>Basis of Design</b>	<b>Material / Colour</b>	<b>Qty.</b>
Guard Rail at Perimeter	Spectrum rails Grouted anchor	SST-Powder	1
Gate at Pool Deck Exit	Breakaway Lane Closure Gate by Brascon Architectural Products Inc.	SST-Powder	2

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:

- .1 Pool waterslide.

### **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:

- .1 Submit manufacturer's *Product* data for *Products* proposed for use in the work of this section.

- .3 Shop drawings:

- .1 Submit engineered shop drawings.
  - .2 Submit detailed shop drawings bearing seal and signature of professional engineer responsible for design of water slide.
  - .3 Provide geometric design of water slides including centre line path and its X, Y and Z coordinates, pump data, plumbing schematic, and drawings.
  - .4 Provide and verify location and elevation of slide support and access prior to their construction and installation.
  - .5 Indicate materials, finishes, fastenings, dimensions required.

- .4 Samples:

- .1 Submit duplicate samples of each material and finish required.

### **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, including detailed operating and maintenance information, complete literature on slide operation and instructions on maintenance.

### **1.5 Quality Assurance**

- .1 Qualifications:

- .1 Installers / applicators / erectors:

Pool Waterslide

---

- .1 *Provide* the work of this section by a *Subcontractor* who has adequate plant, equipment, and skilled workers to perform the work 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, who is completely familiar with referenced standards and requirements of the work of this section, and with approval of *Product* manufacturers. Upon request, Submit proof of qualification in accordance with Section 01 60 00.

## **1.6 Delivery, Storage, and Handling**

- .1 Protect material delivered to the site. Cover and protect fibreglass section from scratches until putting slide into service. Repair or replace cracked or scratched sections.
- .2 Protect steel structure from scratching and damage, which will spoil the visual appearance of the structure. Make good damage.

## **PART 2 - PRODUCTS**

### **2.1 Manufacturers**

- .1 Basis of design:
  - .1 Polin Waterparks as supplied by Aquatics by Westwind Inc.

### **2.2 Performance/Design Requirements**

- .1 Design, fabricate and install work of this section to requirements of the building code and other authorities having jurisdiction. Design shall be by a professional engineer, licensed to practice engineering in the *Place of the Work* and experienced in this type of engineering who shall assume responsibility for final design of water slide, in accordance with general layout and configuration presented in the *Contract Documents* and in accordance with applicable regulatory requirements.
- .2 Furnish labour, materials, plans and equipment required to design, manufacture and complete water slides in accordance with *Contract Documents*, applicable municipal, building code requirements, statutes, and conditions encountered at the *Place of the Work*.
- .3 Design, manufacture and supply water slide sections, parts, appurtenances, pump and plumbing as required to *Provide* a complete and safe slide in accordance with the *Contract Documents*. Refer to Divisions 21, 22, and 23 for pump requirements.
- .4 Design, manufacture and supply steel supports and appurtenances that are attached to and/or supporting water slide. Support slide with continuous circular HSS backbone from platform to deck.
- .5 Number, location and type of supports shall be such as to provide a stable and safe slide, able to carry superimposed live and dead loads.
- .6 Locate structural supports and required braces to the structure.
- .7 Include *Products*, materials, machinery, and equipment, even if not shown or specified that is required to complete the work of this section.
- .8 Provide work required, whether specifically shown or not, so as to make water slide safe and fully functional.

Pool Waterslide

---

- .9 Regulatory requirements: obtain and pay for required permits, inspections and certificates.

## **2.3 Materials**

- .1 Fibreglass:
  - .1 GIN 313 NPG (Neo-Pentryl-Glycol) with UV inhibitors, 18 to 20 mils thick ride surface, 20 mils exterior coating.
  - .2 General fiberglass resins or approved alternative, Isophthalic with 2 to 1 ratio with layers of chop and 18 oz. mat.
  - .3 Standard flume section: 6.5 mm (1/4") thick, weight 1.75 lb per sq. ft.; flanges shall be min. 10.5 mm (13/32") thick, "L" type.
- .2 Bolts, screws, connectors, nuts, washers: stainless steel AISI 304.
- .3 Steel sections and plates: CSA G40.21-04 Grade 300W.
- .4 Tubular steel: CSA G40.21-04, Class H, Grade 350W.
- .5 Welding materials: CSA W59-13.

## **2.4 Waterslide**

- .1 Water Slide: 825 mm (32") diameter closed tube waterslide flume complete with entry tray and open flume transition, approximately 49.6 m (163') long including shutdown lane approximately 8.2 m (27') from a start elevation of approximately 5.44 m.
  - .1 Color to later selection by *Consultant*.
- .2 Steel support framing, including wall-mounted support arm and radial arms, complete with all required bracing and anchorages. To be coordinated with concrete support column for required connections.
- .3 Fibreglass: of thickness sufficient to provide structurally integral section capable of carrying and supporting anticipated static and dynamic loading.

## **2.5 Slide Pump**

- .1 In accordance with Divisions 21, 22, and 23.

## **2.6 Sealant**

- .1 Sealant: type as recommended by slide manufacturer for intended use.

## **2.7 Finishes**

- .1 Grind smooth sharp projections.
- .2 Remove oil and grease by solvent cleaning.
- .3 Hot dip galvanize steel components after fabrication in accordance with requirements of CAN/CSA G164-M92, minimum coating weight 600 g/m<sup>2</sup> (21 oz/ft<sup>2</sup>).
- .4 Clean steel of loose scale, rust, oil, dirt and other foreign matter. Prepare galvanized steel surfaces by sweep blasting SSPC SP-16.
- .5 Apply shop primer and field top coat in accordance with Section 09 96 13, system ST-8.

Pool Waterslide

---

## **2.8 Fabrication**

- .1 Slide:
  - .1 Fabricate individual sections of slide with butting flanges, permitting bolted assembly on site.
  - .2 Radius exposed corners, 4 mm (0.16") minimum.
- .2 Support framing:
  - .1 Fabricate components in largest size practicable to minimize field jointing.
  - .2 Fabricate components square, straight, true, free from warpage and other defects. Cut, machine file and fit joints, corners, copes and mitres, tightly.
  - .3 Reinforce fabricated components to safely withstand expected loads.
  - .4 Make joints in built-up sections with hairline joints in least conspicuous locations.
  - .5 Weld joints unless otherwise indicated and unless details of construction do not permit welding. Continuously weld and grind smooth exposed welds.
  - .6 Close exposed open ends of tubular members with welded on steel cover plate.
  - .7 Grind to remove mill stampings and fill recessed markings on steel components left exposed to view with approved inert filler material compatible with finish.

## **PART 3 - EXECUTION**

### **3.1 Installation**

- .1 Assemble, align, grade, support and lay slide sections in accordance with design and manufacturer's specifications and instructions.
- .2 Erect water slide in accordance with manufacturer's requirements and complete water slide to required geometric and grade profile.
- .3 Seal joints where required. Clean sections and buff fibreglass sections to provide smooth clean exterior and interior surfaces. Grind smooth exterior joints between section, so each section aligns and is radiused 4 mm.
- .4 Coordinate with Divisions 21, 22, and 23 and Divisions 26, 27, and 28 for required mechanical and electrical service connections.

### **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 Closeout Activities**

- .1 Demonstration
  - .1 Inspect and start up slide upon completion of the work of this section and prior to *Substantial Performance of the Work*.
  - .2 Make necessary adjustments or modifications to ensure proper operation.
  - .3 Demonstrate operation to designated *Owner's* representative at a mutually acceptable time.

**END OF SECTION**

Commissioning  
Requirements – Mechanical

---

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Specific requirements relating to commissioning of the project's mechanical components and systems. Refer to section 01 91 13 for general commissioning requirements
- .2 Related Sections:
  - .1 Specific start-up and testing requirements identified in specification sections applicable to all commissioned equipment and systems
  - .2 Section 01 91 13 – General Commissioning Requirements
  - .3 Section 26 08 00 – Commissioning – Electrical
  - .4 Section 01 91 31 – General Commissioning Plan
  - .5 Section 01 91 41 – Commissioning Training
- .3 Acronyms:
  - .1 Cx – Commissioning
  - .2 CxA – Commissioning Authority
  - .3 EMCS – Energy Monitoring and Control Systems
  - .4 O&M – Operation and Maintenance
  - .5 IV – Installation Verification
  - .6 PV – Performance Verification (Functional Testing)
  - .7 TAB – Testing, Adjusting and Balancing

**1.2 SYSTEMS TO BE COMMISSIONED**

- .1 Mechanical systems shall include but is not limited to the following:
  - .1 Plumbing and Drainage Systems;
  - .2 Water Treatment Systems;
  - .3 Heating Systems;
  - .4 Ventilation Systems;
  - .5 Air Conditioning Systems;
  - .6 Fire protection systems;
  - .7 Control System;
  - .8 Pool Systems.

**1.3 TESTING FOR MECHANICAL SYSTEMS PRIOR TO PV**

- .1 Potable Water Systems:
  - .1 Timing: Start up after:
    - .1 Pressure tests have been completed.

Commissioning  
Requirements – Mechanical

---

- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
  - .1 Establish circulation and ensure that air is eliminated.
  - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
  - .3 Bring DHW storage tanks up to design temperature slowly.
  - .4 Monitor piping DHW and DHWR piping systems for freedom of movement, pipe expansion as designed.
  - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.
- .5 Commissioning of Specialties:
  - .1 Water hammer arrestors:
    - .1 Verify accessibility.
  - .2 Backflow preventers, vacuum breakers:
    - .1 Verify installation of correct type to suit application.
    - .2 Adjust as necessary to ensure proper operation.
    - .3 Verify visibility of discharge.
  - .3 Pressure regulators:
    - .1 Adjust settings to suit installed locations, required flow rates.
  - .4 Trap seal primers:
    - .1 Verify operation.
    - .2 Adjust flow rate to suit site conditions.
  - .5 Pipeline strainers:
    - .1 Verify accessibility of basket.
    - .2 Clean out during commissioning until system clean.
- .6 Flushing and cleaning:
  - .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.
    - .1 Disinfection of piping can be done with either chlorination or hot water circulation, except for the following portions of the piping which shall be done with hot water circulation only:
      - .1 Branch piping to RO systems
    - .2 For chlorination, use chlorinated water (25 mg/L). Retain chlorinated water in piping for 24h. Flush system after 24h period.
    - .3 For hot water circulation, piping shall be supplied with hot water of a temperature of at least 70 °C for at least 30 minutes.

Commissioning  
Requirements – Mechanical

---

- .2 Flush entire system for 8 hours. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean. Let system flush for additional 2 hours, then draw off another sample for testing.
- .3 Upon completion, provide laboratory test reports on water quality for Engineer approval.
- .7 When cleaning is completed and system filled:
  - .1 Verify performance of equipment and systems as specified elsewhere in Division 22.
  - .2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.
  - .3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.
- .8 Scheduling:
  - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .9 Procedures:
  - .1 Verify that flow rate and pressure meet Design Criteria.
  - .2 TAB HWC in accordance with Section 22 05 93 - Testing, Adjusting and Balancing for Plumbing.
  - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
  - .4 Sterilize DHW and DHWR systems for Legionella control.
  - .5 Verify performance of temperature controls.
  - .6 Verify compliance with safety and health requirements.
  - .7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
  - .8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
  - .9 Confirm function/sensitivity of all fixtures within design range.
- .10 Reports:
  - .1 In accordance with Section 22 05 00 – Common Work Results for Plumbing.
  - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.
  - .3 Provide start-up reports for all specialty drainage equipment such as neutralization tanks.

Commissioning  
Requirements – Mechanical

---

- .2 Sanitary and Storm Drain Systems:
  - .1 In context of this paragraph, "verify" to include "demonstrate" to CxA.
  - .2 Timing: commission only after start-up deficiencies rectified.
  - .3 Access doors: verify size and location relative to items to be services.
  - .4 Adjust to suit site conditions, including, but not necessarily limited to, following:
    - .1 Floor drains:
      - .1 Verify proper operation of trap primer, flushing features.
      - .2 Verify security and removability of strainers.
      - .3 Prime, using trap primers.
      - .4 Clean out baskets.
    - .2 Cleanouts:
      - .1 Verify covers are gastight, secure and easily removable.
      - .2 Ensure accessible and that access doors are correctly located.
      - .3 Open, cover with linseed oil and re-seal.
      - .4 Verify that cleanout rods can probe as far as the next cleanout, at least.
    - .3 Sump Pumps:
      - .1 Verify system piping and layout matches design schematic.
      - .2 Verify the piping of the system is correct and sized correctly as per the design. Confirm proper installation of valves.
      - .3 Confirm that the pumps rotation is correct.
      - .4 Confirm proper flow is provided through the pumps.
    - .4 Backwater valves:
      - .1 Verify accessibility of cover, valve.
    - .5 Traps:
      - .1 Test to ensure traps are fully and permanently primed.
  - .5 Commissioning reports:
    - .1 Record all results on approved report forms.
    - .2 Include signature of tester and supervisor.
    - .3 To be countersigned by Engineer.
  - .6 Verification:
    - .1 Notify Engineer and CxA 24 h before commencing tests.
    - .2 All tests and procedures to be witnessed by Engineer or CxA.
  - .7 Training:
    - .1 Train O&M personnel in start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
  - .8 Demonstrations:
    - .1 Demonstrate full compliance with Design Criteria.
    - .2 Demonstrations also to show completeness of O&M personnel training.

Commissioning  
Requirements – Mechanical

---

.3 Plumbing Pumps:

.1 General:

.1 In accordance with Section 22 05 00 – Common Work Results for Plumbing: General Requirements, supplemented as specified herein.

.2 Procedures:

- .1 Check power supply.
- .2 Check starter O/L heater sizes.
- .3 Start pumps, check impeller rotation.
- .4 Check for safe and proper operation.
- .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
- .6 Test operation of hands-on-auto switch.
- .7 Test operation of alternator.
- .8 Adjust leakage through water-cooled bearings.
- .9 Adjust shaft stuffing boxes.
- .10 Adjust leakage flow rate from pump shaft stuffing boxes to manufacturer's recommendations.
- .11 Check base for free-floating, no obstructions under base.
- .12 Run-in pumps for 12 continuous hours.
- .13 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
- .14 Adjust alignment of piping and conduit to ensure full flexibility.
- .15 Eliminate causes of cavitation, flashing, air entrainment.
- .16 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .17 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .18 Verify lubricating oil levels.

.2 Performance verification:

.1 Obtain manufacturer's approval, before performing PV, to ensure warranties remain intact.

.2 PV procedures:

- .1 Open pump balancing valve fully.
- .2 Measure differential pressure (DP) across pump.
- .3 Measure amperage and voltage and compare with manufacturer's data sheets and motor nameplate data.
- .4 If suction is different size than discharge connection, add velocity head correction factor to DP.
- .5 Mark this DP on manufacturer's pump curve.

Commissioning  
Requirements – Mechanical

---

- .6 If flow rate is higher than specified, slow close balancing valve until specified DP is reached.
  - .7 Repeat measurements of amps and volts. Compare with manufacturer's data sheets.
  - .8 Calculate BHP and compare with nameplate data.
- .4 Fixtures:
  - .1 Conform to water conservation requirements specified this section.
  - .2 Adjustments.
    - .1 Adjust water flow rate to design flow rates.
    - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
    - .3 Adjust flush valves to suit actual site conditions.
    - .4 Adjust urinal flush timing mechanisms.
    - .5 Adjust water cooler, drinking fountain flow stream to ensure no spillage.
    - .6 Automatic flush valves for WC's and urinals: set controls to prevent unnecessary flush cycles during silent hours.
  - .3 Checks.
    - .1 Water closets, urinals: flushing action.
    - .2 Aerators: operation, cleanliness.
    - .3 Vacuum breakers, backflow preventers: operation under all conditions.
    - .4 Wash fountains: operation of flow-actuating devices.
    - .5 Refrigerated water coolers: operation, temperature settings.
  - .4 Thermostatic controls.
    - .1 Verify temperature settings, operation of control, limit and safety controls.
- .5 Flushing and Cleaning of Hydronic Systems:
  - .1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.
  - .2 Cleaning Agency:
    - .1 Retain qualified water treatment specialist to perform system cleaning.
  - .3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.
  - .4 Cleaning procedures:
    - .1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:
      - .1 Cleaning procedures, flow rates, elapsed time.
      - .2 Chemicals and concentrations used.
      - .3 Inhibitors and concentrations.

Commissioning  
Requirements – Mechanical

---

- .4 Specific requirements for completion of work.
- .5 Special precautions for protecting piping system materials and components.
- .6 Complete analysis of water used to ensure water will not damage systems or equipment.
- .5 Conditions at time of cleaning of systems:
  - .1 Systems: free from construction debris, dirt and other foreign material.
  - .2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.
  - .3 Strainers: clean prior to initial fill.
  - .4 Install temporary filters on pumps not equipped with permanent filters.
  - .5 Install pressure gauges on strainers to detect plugging.
- .6 Report on Completion of Cleaning:
  - .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.
- .7 Hydronic Systems:
  - .1 If using temporary connection into potable service, ensure that there is no possibility of backflow or cross-contamination.
  - .2 Fill system with water or correct heat transfer fluid, ensure air is vented from system.
  - .3 Use water meter to record volume of water in system to +/- 0.5%
  - .4 Add cleaning solution and circulate at 60 degrees C for 36 hours. Drain quickly as possible.
  - .5 Refill with water plus inhibitors. Test concentration and adjust to recommended levels. Flush velocity in system mains and branches to be adequate to ensure removal of debris. System pumps may be used for circulating cleaning solution provided velocities are adequate.
  - .6 Add cleaning solution to system. Establish circulation, raise temperature slowly to maximum design or 82 degrees C minimum. Circulate for 12 hours, ensuring flow in circuits. Remove heat, continue to circulate until temperature is below 38 degrees C. Drain quickly as possible.
  - .7 Refill with clean water. Circulate for 6 hours at design temperature. Drain.
  - .8 Repeat procedures specified above. Flush through at low point drains in system.
  - .9 Refill with clean water adding sodium sulphite (test for residual sulphite).
  - .10 Drainage to include drain valves, dirt pockets, strainers, low points in system.
  - .11 Re-install strainer screens/baskets only after obtaining Engineer's approval.

Commissioning  
Requirements – Mechanical

---

- .8 Disposal of cleaning solutions to be approved by authority having jurisdiction.
- .9 Glycol Systems:
  - .1 In addition to procedures specified above perform specified procedures.
    - .1 Test to prove concentration will prevent freezing temperatures specified in Section 23 25 00 – HVAC Water Treatment System. Test inhibitor strength and include in procedural report. Refer to ASTM E202.
- .6 Start-up of Hydronic Systems:
  - .1 After cleaning is completed and system is filled:
    - .1 Establish circulation and expansion tank level, set pressure controls.
    - .2 Ensure air is removed.
    - .3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.
    - .4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
    - .5 Clean out strainers repeatedly until system is clean.
    - .6 Commission water treatment systems as specified herein and in Section 23 25 00 - HVAC Water Treatment Systems.
    - .7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.
    - .8 Repeat with water at design temperature.
    - .9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
    - .10 Bring system up to design temperature and pressure slowly.
    - .11 Eliminate water hammer and other noises.
    - .12 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
    - .13 Adjust pipe supports, hangers, springs as necessary.
    - .14 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
    - .15 During warm-up, check operation of expansion loops, joints, anchors and guides.
    - .16 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, repeat start-up procedures.
    - .17 Verify adequacy of accessibility to expansion joints for servicing.
    - .18 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.
    - .19 Check operation of drain valves.

Commissioning  
Requirements – Mechanical

---

- .20 Adjust valve stem packings as systems settle down.
- .21 Fully open balancing valves (except those that are factory-set).
- .22 Check operation of over-temperature protection devices on circulating pumps.
- .23 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.
- .24 Check pressure bypass operation (if provided).
- .25 Test operation of operating, limit and safety controls.
- .26 Verify performance and thermal efficiency at various flow rates produced during these tests.
- .27 Check operation of make-up system by simulating blowdown and leakage. Adjust PRV on water make-up. Ensure backflow preventer is operating properly.
- .28 Record pressure drops across control valves at design flow rate.
- .29 Check for water hammer or water noise. Fasten loose items of equipment to ensure quiet operation of system.
- .2 Performance Verification:
  - .1 Perform hydronic systems performance verification after cleaning is completed and system is in full operation.
  - .2 When systems are operational, perform following tests:
    - .1 Conduct full scale tests at maximum design flow rates, temperatures and pressures for continuous consecutive period of 48 hours to demonstrate compliance with design criteria.
    - .2 Verify performance of hydronic system circulating pumps as specified, recording system pressures, temperatures, fluctuations by simulating maximum design conditions and varying.
      - .1 Pump operation.
      - .2 Boiler and/or chiller operation.
      - .3 Pressure bypass open/closed.
      - .4 Control pressure failure.
      - .5 Maximum heating demand.
      - .6 Maximum cooling demand.
      - .7 Boiler and/or chiller failure.
      - .8 Outdoor reset. Re-check heat exchanger output supply temperature at 100% and 50% reset, maximum water temperature.
- .3 Heating system capacity test:
  - .1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:
    - .1 Increasing OA flow rates through heating coils (in this case, monitor heating coil discharge temperatures to ensure that coils are not subjected to freezing conditions) or

Commissioning  
Requirements – Mechanical

---

- .2 Reducing space temperature by turning of heating system for sufficient period of time before starting testing.
- .2 Test procedures:
  - .1 Open fully heat exchanger, heating coil and radiation control valves.
  - .2 With boilers on full firing and hot water heating supply temperature stabilized, record flow rates and supply and return temperatures simultaneously.
  - .3 Conduct flue gas analysis test on boilers at full load and at low fire conditions.
- .4 Glycol systems:
  - .1 Test to prove concentration will prevent freezing to minus 40 degrees C Test inhibitor strength and include in procedural report. Refer to ASTM E202. Coordinate with Section 23 25 00 – HVAC Water Treatment.
- .7 Hydronic Pumps:
  - .1 General:
    - .1 In accordance with Section 23 05 00 – Common Work Results for HVAC: General Requirements, supplemented as specified herein.
    - .2 Procedures:
      - .1 Before starting pump, check that cooling water system over-temperature and other protective devices are installed and operative.
      - .2 After starting pump, check for proper, safe operation.
      - .3 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
      - .4 Check base for free-floating, no obstructions under base.
      - .5 Run-in pumps for 12 continuous hours minimum.
      - .6 Verify operation of over-temperature and other protective devices under low- and no-flow condition.
      - .7 Eliminate air from scroll casing.
      - .8 Adjust water flow rate through water-cooled bearings.
      - .9 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.
      - .10 Adjust alignment of piping and conduit to ensure true flexibility.
      - .11 Eliminate cavitation, flashing and air entrainment.
      - .12 Adjust pump shaft seals, stuffing boxes, glands.
      - .13 Measure pressure drop across strainer when clean and with flow rates as finally set.
      - .14 Replace seals if pump used to degrease system or if pump used for temporary heat.
      - .15 Verify lubricating oil levels.
  - .2 Performance verification:

Commissioning  
Requirements – Mechanical

---

- .1 General:
  - .1 Verify performance in accordance with Section 23 05 00 – Common Work Results for HVAC.
  - .2 Verify that manufacturer's performance curves are accurate.
  - .3 Ensure valves on pump suction and discharge provide tight shut-off.
  - .4 Net Positive Suction Head (NPSH):
    - .1 Application: measure NPSH for pumps which operate on open systems and with water at elevated temperatures.
  - .5 Multiple Pump Installations - Series and Parallel:
    - .1 Repeat PV procedures specified above for pump performance and pump BHP for combinations of pump operations.
  - .6 Mark points of design and actual performance at design conditions as finally set upon completion of TAB.
  - .7 Commissioning Reports: in accordance with Section 23 05 00 – Common Work Results for HVAC, reports supplemented as specified herein. Reports to include:
    - .1 Record of point(s) of actual performance at maximum and minimum conditions and for single and parallel operation as finally set at completion of commissioning on pump curves.
    - .2 Pump performance curves (family of curves).
- .3 Perform site inspection visit by manufacturer's representative to verify that installation complies with manufacturer's instructions:
  - .1 After installation is substantially complete and ready to be tested/commissioned.
  - .2 Provide written report to Engineer and CxA.
- .8 HVAC Water Treatment:
  - .1 Timing:
    - .1 After start-up deficiencies rectified.
    - .2 After start-up and before TAB of connected systems.
  - .2 Pre-commissioning Inspections:
    - .1 Verify:
      - .1 Presence of test equipment, reagents, chemicals, details of specific tests to be performed, operating instructions.
      - .2 Suitability of log book.
      - .3 Currency and accuracy of initial water analysis.
      - .4 Required quality of treated water.
  - .3 Commissioning procedures - applicable to all Water Treatment Systems:
    - .1 Establish, adjust as necessary and record automatic controls and chemical feed rates.
    - .2 Monitor performance continuously during commissioning of connected systems and until acceptance of project.

Commissioning  
Requirements – Mechanical

---

- .3 Establish test intervals, regeneration intervals.
- .4 Record on approved report forms commissioning procedures, test procedures, dates, times, quantities of chemicals added, raw water analysis, treated water analysis, test results, instrument readings, adjustments made, results obtained.
- .5 Establish, monitor and adjust automatic controls and chemical feed rates as necessary.
- .6 Visit project at specified intervals after commissioning is satisfactorily completed to verify that performance remains as set during commissioning (more often as required until system stabilizes at required level of performance).
- .7 Advise Engineer in writing on matters regarding installed water treatment systems.
- .4 Commissioning procedures - Closed Circuit Hydronic Systems:
  - .1 Analyse water in system.
  - .2 Based upon an assumed rate of loss approved by Engineer, establish rate of chemical feed.
  - .3 Record types, quantities of chemicals applied.
- .5 Training:
  - .1 Commission systems, perform tests in presence of, and using assistance of, assigned O&M personnel.
  - .2 Train O&M personnel in softener regeneration procedures.
- .6 Certificates:
  - .1 Upon completion, furnish certificates confirming satisfactory installation and performance.
- .7 Commissioning Reports:
  - .1 To include system schematics, test results, test certificates, raw and treated water analyses, design criteria, all other data required by Engineer.
- .8 Commissioning activities during Warranty Period:
  - .1 Check out water treatment systems on regular basis and submit written report to Engineer.
- .9 Acoustical Air Plenums:
  - .1 Testing:
    - .1 Establish adequacy of equipment isolation, acceptability of noise levels in occupied areas, other conditions affecting acoustics and, where appropriate, recommendation for remedial measures and costs.
    - .2 Sound measurements to extend over frequency range of 20 Hz to 20 000 Hz and taken:
      - .1 Upstream and downstream of each plenum.
      - .2 In areas adjacent to mechanical equipment rooms, duct and pipe shafts.
      - .3 At 1800 mm above floor adjacent to first air terminal.

Commissioning  
Requirements – Mechanical

---

- .4 At following critical locations:
  - .1 Fourth floor underneath each supply and return fans, at 1800 mm above finished floor.
- .3 Provide Engineer and CxA with notice 24 h in advance of commencement of tests.
- .4 Establish adequacy of equipment isolation, acceptability of noise levels in occupied areas, other conditions affecting acoustics and, where appropriate, recommendation for remedial measures and costs.
- .5 Submit complete report of test results including sound curves.
- .2 Manufacturer's Field Services:
  - .1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
  - .2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:
    - .1 After delivery and storage of products.
    - .2 After preparatory work is complete but before installation commences.
    - .3 Twice during the installation, at 25% and 60% completion stages.
    - .4 Upon completion of installation.
  - .3 Submit manufacturer's reports to Engineer and CxA within 3 days of manufacturer representative's review.
- .10 Start-up of HVAC Fans:
  - .1 General:
    - .1 In accordance with Section 23 05 00 – Common Work Results for HVAC: General Requirements, supplemented as specified herein.
  - .2 Procedures:
    - .1 Check power supply.
    - .2 Check starter O/L heater sizes.
    - .3 Start fans, check impeller rotation.
    - .4 Check for safe and proper operation.
    - .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
    - .6 Test operation of hands-on-auto switch.
    - .7 Test operation of alternator.
    - .8 Adjust leakage through water-cooled bearings.
    - .9 Adjust shaft stuffing boxes.
    - .10 Run-in pumps for 12 continuous hours.
    - .11 Adjust alignment of ducts to ensure full flexibility.
    - .12 Eliminate causes of excessive vibrations.

Commissioning  
Requirements – Mechanical

---

- .13 Verify lubricating oil levels.
- .2 Performance verification:
  - .1 Obtain manufacturer's approval, before performing PV, to ensure warranties remain intact.
  - .2 PV procedures:
    - .1 Verify the fan size and capacity. Capacity tests results should be evaluated in the light of the accuracy of in instrumentation and the actual conditions at the time of the test.
    - .2 Backdraft dampers need to be tested for proper operation. Non-motorized dampers must open and close freely without binding. Motorized dampers must be connected to the EMCS control system and verified that they are commanded open prior to fan operation.
    - .3 Verify that network failures do not result in unsafe operating modes. The recovery from the failure should safely return the drive to the network.
    - .4 Verify that drive settings and adjustments provide for safe and reliable system operation at peak efficiency levels in all operating modes.
    - .5 Verify that any belt drives have been adjusted and aligned.
    - .6 Verify all safeties, interlocks, and alarms are programmed (or hard-wired, if applicable) and function correctly, regardless of VFD operating position (i.e. hand, auto, by-pass).
    - .7 If necessary, verify that the motor shaft is grounded.
    - .8 Verify distribution system pressure drops do not exceed design expectations.
    - .9 Verify all VFD operating parameters are correct for the application, including acceleration and deceleration times and minimum speed setting.
- .11 Start-up of HVAC Hydronic Exchangers (including Domestic Hot Water Tanks):
  - .1 General:
    - .1 Check heater for cleanliness on primary and secondary sides.
    - .2 Check water treatment system is complete, operational and correct treatment is being applied.
    - .3 Check installation, settings, operation of relief valves and safety valves.
    - .4 Check installation, location, settings and operation of operating, limit and safety controls.
    - .5 Check supports, seismic restraint systems.
    - .6 Timing: only after TAB of hydronic systems have been successfully completed.
  - .2 Primary side:

Commissioning  
Requirements – Mechanical

---

- .1 Measure flow rate, pressure drop, and either 1) steam pressure and temperature at heater inlet or 2) water temperature at heater inlet and outlet.
  - .1 Verify operation of steam traps. Measure temperature of condensate return at trap outlet.
- .2 Control valve: verify proper operation without binding, slack in components. Measure either steam pressure and temperature at control valve inlet or if control is three-port type, pressure drop across inlet to common, bypass to common, inlet to bypass.
- .3 Secondary side:
  - .1 Measure flow rate, pressure drop and water temperature at heater inlet and outlet.
  - .2 Verify installation and operation of air elimination devices.
- .4 Calculate heat transfer from primary and secondary sides.
- .5 Simulate heating water temperature schedule and repeat above procedures.
- .6 Verify settings, operation, safe discharge from safety valves and relief valves.
- .7 Verify settings, operation of operating, limit and safety controls and alarms.
- .8 Reports:
  - .1 As specified herein.
- .12 Start-up of Air to Air Energy Recovery Equipment:
  - .1 General:
    - .1 For fan powered equipment, do start-up of fans as per fan requirements herein.
    - .2 Check heat exchanger for cleanliness on supply and return sides.
    - .3 Check installation, location, settings and operation of operating, limit and safety controls.
    - .4 Check supports, seismic restraint systems.
    - .5 Timing: only after TAB of air systems have been successfully completed.
    - .6 Have manufacturer present during start-up and certify performance.
    - .7 Submit written start-up and commissioning reports as specified herein to Engineer and CxA.
  - .2 Supply and return side:
    - .1 Measure flow rate, outlet pressure, and either air temperature at exchanger inlet and outlet.
    - .2 Calculate heat transfer from supply and return sides.
    - .3 Verify settings, operation, safe discharge from safety valves and relief valves.
    - .4 Verify settings, operation of operating, limit and safety controls and alarms.

Commissioning  
Requirements – Mechanical

---

- .5 Reports:
  - .1 As specified herein.
- .3 Heat Wheel:
  - .1 Verify proper rotation and controls of heat wheel
- .4 Perform site inspection visit by manufacturer's representative to verify that installation complies with manufacturer's instructions:
  - .1 After installation is substantially complete and ready to be tested/commissioned.
  - .2 Provide written report to Engineer and CxA.
- .13 Start-up of Air Handling Units:
  - .1 General:
    - .1 In accordance with Section 23 05 00 – Common Work Results for HVAC: General Requirements, supplemented as specified herein.
    - .2 Start-up of fans to be made as per requirements specified elsewhere in this section.
    - .3 Have manufacturer present during start-up and certify performance.
    - .4 Submit written start-up and commissioning reports as specified herein to Engineer and CxA.
  - .2 Verify check-list prior to start-up:
    - .1 Unit in general:
      - .1 Casing is in good condition (dents, cracks, leaks?)
      - .2 Shipping restraints have been removed
      - .3 Adequate maintenance access to all components
      - .4 No unusual noise or vibration
      - .5 Electrical connections tight
      - .6 Air filters clean and tight fitting
      - .7 All dampers move freely and close tightly
      - .8 All dampers are properly linked
      - .9 Thermometers, pressure gauges and wells are installed as per specification
    - .2 Hydronic/steam Coils:
      - .1 Coils are clean and in good condition
      - .2 No damage to heat transfer fins
      - .3 No air bypass between coil & casing
      - .4 Valves are properly installed
      - .5 3-way valves ported properly
      - .6 Flow direction is correct
      - .7 Condensate pan clean and draining properly
      - .8 Steam traps don't pass steam when valves are open
  - .3 Performance verification:

Commissioning  
Requirements – Mechanical

---

- .1 Obtain manufacturer's approval, before performing PV, to ensure warranties remain intact.
- .2 PV procedures:
  - .1 Functional performance test: Contractor shall demonstrate operation of Air Handling Unit as per specifications.
  - .2 Ventilation contractor to work closely with EMCS contractor to ensure that AHU runs through entire sequence of operation without any issues.
  - .3 Run through PV procedures of fans as described herein.
  - .4 If heat exchanger is present, run through PV procedures of air to air energy recovery equipment as described herein.
- .4 All handling units supplying air to type I or type II areas (critical areas, patient areas, treatments areas and patient support areas) must be run at 100% fresh air for a minimum of 48h prior to occupation in order to remove any contaminants from work area.
  - .1 Timing of air flushing procedure: after TAB is completed and after substantial work within work area is completed. All ceilings must be installed. All painting, flooring, and any other work which may produce VOCs must be finished.
- .14 Start-up of Other Packaged HVAC Equipment:
  - .1 General:
    - .1 In accordance with Section 23 05 00 – Common Work Results for HVAC: General Requirements, supplemented as specified herein.
  - .2 Any fans found within packaged units shall be commissioned as per fan requirements herein.
  - .3 Operate equipment and verify that performance criteria specified in equipment's section has been achieved.
  - .4 Perform site inspection visit by manufacturer's representative to verify that installation complies with manufacturer's instructions:
    - .1 After installation is substantially complete and ready to be tested/commissioned.
    - .2 Provide written report to Engineer and CxA.
- .15 The Independent Testing and Balancing Contractor's balancing of water and glycol hydronic systems:
  - .1 Contractor shall co-ordinate with TAB Contractor and provide assistance during balancing process.
  - .2 Balancing shall not begin until all point to point and EMCS component testing has been satisfactorily completed.
  - .3 TAB Contractor shall balance the entire water system to ensure all equipment and systems are operating to design conditions. Adjust the circuits by means of the balancing valves and record the balance positions.
  - .4 Each pump shall be checked for design, working and shut-off head conditions. Any pump that varies by more than 10% from the design

Commissioning  
Requirements – Mechanical

---

- conditions shall have the impeller trimmed or pump changed until design conditions have been met. Contractor shall pay for impeller trimming.
- .5 Flow through all heat exchangers and other such equipment shall be balanced to ensure that the pressure drop through the equipment is within 10% of manufacturer's design conditions.
- .6 Initial balancing of coils shall be used to ensure that the pressure drops are within 10% of manufacturers' design conditions. When both the air and water systems are fully operational, entering air and water, and leaving air and water readings shall be taken as close as possible to the peak design conditions to ensure the coil performance meets the design conditions. Coil water working conditions shall only be taken in conjunction with the air flow working conditions for the coil.
- .7 Adjust bleed-off from evaporative condensers, spray coils and similar equipment to prevent lime deposits. Record bleed-off rate.
- .8 TAB Contractor shall co-ordinate with Contractor to ensure all necessary devices and valves for control and balancing are installed in all necessary locations. Notify Engineer and CxA in writing that this co-ordination has taken place. Include in this letter any recommendations made regarding valves, locations, installation, etc. If TAB Contractor fails to coordinate with Contractor and if failure to co-ordinate results in being unable to balance the systems, the cost of any changes required shall be paid for by TAB Contractor at no cost to Owner.
- .9 TAB Contractor shall not disconnect any direct digital control (DDC) device after it has been calibrated. EMCS Contractor shall make all necessary adjustments through the control system as requested by TAB Contractor. If TAB Contractor fails to co-ordinate with EMCS Contractor and if failure to co-ordinate results in any cost, the cost of any change required shall be paid for by TAB Contractor at no cost to Owner.
- .10 TAB Contractor shall coordinate with the EMCS Contractor and receive instruction regarding set-up, calibration and operation of the DDC as it applies to the TAB Contractor work. The EMCS Contractor shall provide the TAB Contractor with a portable operator's terminal for this work.
- .11 TAB Contractor is responsible for balancing the systems to obtain the design conditions and shall repeat the balancing until the required conditions have been met.
- .12 At time of final inspection, recheck, in presence of the Engineer and CxA, random selections of data recorded in the certified report. Points or areas of recheck shall be selected by the Engineer/CxA and shall be up to a maximum of 50% of the report data.
- .13 A measured deviation of more than 10% between the verification reading and the reported data will be considered as failing the verification procedure.
- .14 A failure of more than 10% of the selected verification readings will be considered unacceptable and will result in rejection of the report.
- .15 In the event the report is rejected, rebalance all systems, submit new certified reports and perform a re-inspection, all at no additional cost to Owner.

Commissioning  
Requirements – Mechanical

---

- .16 Following final acceptance of the certified reports by the Engineer, permanently mark the settings of all valves and other adjustable devices so that balance set position can be restored if distributed at any time. For circuit balancing valves, record the valve position by the number of turns registered on the valve and lock the valve into that position. Do not mark such devices until after final acceptance.
- .17 Submit 1 Hard copy in a binder and 1 PDF on a USB drive of the final testing and balancing reports to the Engineer. Reports shall be complete with index pages and index tabs and certified by TAB Contractor. Any diagram or single line representation of a mechanical system specifically prepared for this project shall be prepared using a CAD system and shall be acceptable to the Engineer.
- .18 Submit a copy of the report to the CxA for review.
- .19 Include in the water balancing report: Types, serial numbers, dates, and calibration of all instruments used in balancing report.
- .16 The Independent Testing and Balancing Contractor's balancing of air systems:
  - .1 Contractor shall co-ordinate with TAB Contractor and provide assistance during the balancing process.
  - .2 Balancing shall not begin until all point to point and EMCS component testing has been satisfactorily completed.
  - .3 TAB Contractor shall balance the entire air systems including air volumes and control settings under maximum system pressure drop conditions (filter at replacement condition).
  - .4 TAB Contractor shall take air measurements, make final adjustments and report upon the air volume at each variable volume box, diffuser, register and grille. Measure the static pressure upstream and downstream of the fan, the fan speed and the motor current.
  - .5 Measure the return and supply air flow when mixing dampers are set for full outside air and minimum outside air position.
  - .6 Set the minimum position for the mixing dampers. Coordinate with EMCS Contractor.
  - .7 Contractor shall provide new filters, when the final balancing has been completed.
  - .8 Air volumes measured by TAB Contractor shall be within  $\pm 5\%$  of those shown on Drawings for diffusers, grilles, registers, variable air volume boxes and fans, at both maximum and minimum volumes shown.
  - .9 Duct traverse readings shall be taken through access ports. The access ports shall be Duro Dyne IP-1 or IP-2 air tight type. Duct tape is not acceptable.
  - .10 The insulation or vapour barrier shall be repaired in an approved manner, if damaged.
  - .11 For variable air volume boxes, TAB Contractor shall verify the minimum and maximum air volumes after the VAV boxes are commissioned by the EMCS Contractor.
  - .12 In all cases where measurements by TAB Contractor show failure to comply with the drawings and specifications, Contractor at no cost to

Commissioning  
Requirements – Mechanical

---

- Owner shall change fan sheaves, etc., as required, and new balancing measurements shall be taken, and a report issued, by TAB Contractor.
- .13 Ensure all thermostats and controls are set to give the specified conditions and include settings in the report.
- .14 Adjust each supply outlet to provide proper throw and distribution in accordance with architectural requirements.
- .15 Fans on all systems shall be set-up to give the minimum discharge pressure required to overcome the resistance of the box, discharge ductwork and diffusers.
- .16 Coordinate with Contractor to ensure that all necessary manual and splitter dampers for balancing are installed in all necessary locations. Notify the Engineer in writing that this co-ordination has taken place. Include in this letter any recommendations made regarding dampers, locations, installation, etc. If TAB Contractor fails to co-ordinate with Contractor and if failure to co-ordinate results in being unable to balance the systems, the cost of any changes required shall be paid for by TAB Contractor at no cost to Owner.
- .17 TAB Contractor shall not disconnect any control device after it has been calibrated. EMCS Contractor shall make all necessary adjustments through Energy Management Controls Systems as requested by TAB Contractor. If TAB Contractor fails to co-ordinate with EMCS Contractor and if failure to co-ordinate results in any cost, the cost of any change required shall be paid for by TAB Contractor at no cost to Owner.
- .18 TAB Contractor shall co-ordinate with EMCS Contractor and receive instruction regarding set-up, calibration and operation of the DDC as it applies to TAB Contractor work. EMCS Contractor shall provide, TAB Contractor, with a portable operator's terminal for this work.
- .19 TAB Contractor is responsible for balancing the systems to obtain the design conditions and shall repeat the balancing until the required conditions have been met.
- .20 At the time of final inspection, recheck in the presence of the Engineer and CxA random selections of air quantities and fan data recorded in the certified report. Points or areas for recheck would be selected by the Engineer/CxA and shall be a maximum of up to 50% of the report data.
- .21 At the time of verification measure space temperature and relative humidity in a representative number of rooms to verify performance. Tabulate these results and include in certified report as an appendix.
- .22 A measured flow deviation of more than 10% between the verification reading and the reported data will be considered as failing the verification procedure.
- .23 A failure of more than 10% of the selected verification readings will be considered unacceptable and will result in rejection of the report.
- .24 In the event the report is rejected, rebalance all systems, submit new certified reports and re-inspect, all at no additional cost to Owner.
- .25 Following final acceptance of the certified report by the Engineer, permanently mark the settings of all dampers, splitters and other adjustable devices so balance set position can be restored if distributed at any time. Do not mark such devices until after final acceptance.

Commissioning  
Requirements – Mechanical

---

- .26 Submit one Searchable PDF copy of the final testing and balancing report to the Engineer. Reports shall be complete with index pages and index tabs and certified by TAB Contractor. Any diagram or single line representation of a mechanical system specifically prepared for this project shall be prepared using a CAD system and shall be acceptable to the Engineer.
- .27 Submit a copy of the report to CxA for review.
- .28 Include in balancing report:
  - .1 Types, serial numbers and dates of calibration of all instruments used in balancing report;
  - .2 Equipment data, manufacturer and model size, arrangement discharge and class, motor type, horse power, voltage, phase, cycles and full load amps. Location and local identification data;
  - .3 Fan design data, total volume flow rate, static pressure, motor type, RPM, volts, full load amps and outside air flow rate;
  - .4 A complete system schematic with design and actual flow rates at each outlet or inlet. Show room numbers and floors. Duct air quantities: for mains, branches and maximum and minimum for outside air and exhausts, duct size, pressure readings, average velocity, duct recorded flow rates, duct design flow rates. Air inlet and outlets, supply or exhaust outlet identification. Location and number designation;
  - .5 Manufacturers' catalogue identification and type, of air inlets and outlets application factors, designated area, design and recorded velocities, design and recorded air flow rates, deflector vane of diffusion cone settings.
- .17 Fire Protection System:
  - .1 Contractor shall hydrostatically test the systems as per the specifications and NFPA requirements to meet all certifications. The test shall be witnessed. Provide a copy of the report in NFPA 13 reporting format for all such test to the CxA.
  - .2 Contractor to perform flow, alarm, drain flow and supervision as required.
  - .3 Coordinate interfacing with fire alarm control panel installation specified under Division 28. Perform test include smoke control and evacuation as required by this specification, National Building Code and its Supplementary Guidelines and Authorities having Jurisdiction.
  - .4 Obtain approval certificates from Authorities having Jurisdiction and submit copies of the certificates to the CxA for review.
- .18 Life Safety Systems:
  - .1 Include equipment and systems identified in the commissioning plan.
  - .2 Reports of test results to be witnessed and certified by CxA or by local authority having jurisdiction before verification.
- .19 Energy Management Controls Systems:

Commissioning  
Requirements – Mechanical

---

- .1 The Energy Management Controls Systems shall be fully tested and commissioned by manufacturer's technician to operate in the manner defined by the specifications.
- .2 EMCS Contractor shall provide a print-out of general and critical alarm lists and all points connected to the Energy Management Controls Systems. The all point log shall be sub-divided into points per system. One report shall be taken prior to the acceptance test.
- .3 EMCS Contractor shall provide an operating terminal and sufficient training and instruction to TAB Contractor which will allow them to set-up and balance the water and air systems.
- .4 A point-to-point testing shall be done by EMCS Contractor. This test shall include, but is not limited to:
  - .1 Ensuring that wiring is accurately connected to appropriate terminals;
  - .2 Checking the function of each control and controlled device (such as the beginning, end and extent of actuator travel);
  - .3 Connection integrity between actuator and device;
  - .4 Calibration of sensors;
  - .5 Output from sensors;
  - .6 Operation of relays;
  - .7 Data/information integrity at console;
  - .8 Remote reset integrity from console to field device;
  - .9 Interfacing with other systems such as life safety monitoring system.
  - .10 EMCS contractor in conjunction with the mechanical contractor shall create simulated design load conditions for control verification tests.
- .5 Testing procedure shall include but is not limited to:
  - .1 Check and verify that each input point is reporting to the Energy Management Controls Systems panels and workstations in the normal state and change or state;
  - .2 Create false alarms at each point and provide a print-out of the test;
  - .3 Command each output point, via the workstation and verify the action at the device;
  - .4 Verify that each time of day and optimum start program is operational in software and at the device;
  - .5 Verify that each program is operational in software and at the device(s);
  - .6 Verify that each system graphic is dynamically updating;
  - .7 Test each DDC loop and verify that it is controlling in a stable manner. Create set point changes on output points. False loads shall be introduced to observe the control loops response. Program trend logs at the Energy Management Controls Systems for a minimum of 30 minutes per control loop with a sampling time of 30 seconds. Provide a print-out of the results. Tune each DDC

Commissioning  
Requirements – Mechanical

---

- loop prior to acceptance test. Check each loop again, once during the heating and once during the cooling season and re-tune where necessary;
- .8 Verify that each report type is functional;
  - .9 Verify that each global program that controls more than 1 system is operating;
  - .10 Verify that all safeties are operating (ie. firestats);
  - .11 Verify valve and damper actuation;
  - .12 Verification of the minimum and maximum settings on VAV boxes;
  - .13 Verify the calibration of each analog input point.
- .6 Any sensor disconnected from the input terminal after completion of the performance test shall be retested.
- .7 EMCS Contractor shall provide a "signed-off" copy of the results of all tests to the Engineer. Acceptance test will not begin until the tests have been reviewed and accepted. Engineer and CxA shall witness these tests.
- .8 Provide the calibration procedure for each analog sensor. Physically check the calibration of each analog sensor type using a calibrated instrument prior to testing.
- .9 When all tests have been completed EMCS Contractor shall request the acceptance test procedure shall begin. Engineer shall verify the installation is complete and all tests have been performed and have been successful. EMCS Contractor shall then initiate the acceptance test.
- .10 The acceptance test period shall be 21 Days. EMCS Contractor shall visit the site each morning. Monday to Friday, to review the Energy Management Controls Systems operation and the building operators log book. The operators log book shall be provided by the EMCS Contractor and shall contain all problems experienced by the Custodians. The log shall show the point name and number, time and date of failure and time of return service. During the first 14 Days of the acceptance test, any operational or equipment failures shall be corrected and the acceptance test shall continue from the date the failure has been corrected. During the last 7 Days of testing, no major failures of any kind will be accepted, or the last 7 Days shall be repeated.
- .11 During the acceptance test Contractor shall print out 1 "all-points" log per day. The logs shall be issued to the Engineer for review.
- .12 EMCS Contractor shall set up trend logs and group logs which shall be stored on hard disk for review by the Engineer.
- .13 System shall not be accepted or considered substantially complete until all tests are completed and approved.
- .14 EMCS Contractor shall provide a minimum of 2 weeks notice to the Engineer prior to testing date.
- .15 EMCS Contractor shall revisit the site during the first year of operation to review the performance of the Energy Management Controls Systems. The review shall include DDC loop tuning, sensor calibration, programs, communication, DDC panels, workstations and the operational logs. The visits shall be a minimum of 8 hours each visit. The visits shall be:

Commissioning  
Requirements – Mechanical

---

- .1 Beginning of cooling season;
  - .2 During the cooling season;
  - .3 Beginning of heating season;
  - .4 During the heating season.
- .20 Pool Systems:
- .1 Timing:
    - .1 After start-up deficiencies rectified.
    - .2 After start-up and before TAB of connected systems.
  - .2 Pre-commissioning Inspections:
    - .1 Verify:
      - .1 Presence of test equipment, reagents, chemicals, details of specific tests to be performed, operating instructions.
      - .2 Suitability of log book.
      - .3 Currency and accuracy of initial water analysis.
      - .4 Required quality of treated water.
  - .3 Commissioning procedures - applicable to all Pool Water Treatment and Filtration Systems:
    - .1 Establish, adjust as necessary and record automatic controls and chemical feed rates.
    - .2 Monitor performance continuously during commissioning of connected systems and until acceptance of project.
    - .3 Establish test intervals, regeneration intervals.
    - .4 Record on approved report forms commissioning procedures, test procedures, dates, times, quantities of chemicals added, raw water analysis, treated water analysis, test results, instrument readings, adjustments made, results obtained.
    - .5 Establish, monitor and adjust automatic controls and chemical feed rates as necessary.
    - .6 Advise Engineer in writing on matters regarding installed pool water treatment systems.
  - .4 Commissioning procedures - applicable to all Pool System Pumps:
    - .1 After starting pump, check for proper, safe operation.
    - .2 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
    - .3 Check base for free-floating, no obstructions under base.
    - .4 Run-in pumps for 12 continuous hours minimum.
    - .5 Verify operation of over-temperature and other protective devices under low- and no-flow condition.
    - .6 Eliminate air from scroll casing.
    - .7 Adjust water flow rate through water-cooled bearings.
    - .8 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.
    - .9 Adjust alignment of piping and conduit to ensure true flexibility.

Commissioning  
Requirements – Mechanical

---

- .10 Eliminate cavitation, flashing and air entrainment.
- .11 Adjust pump shaft seals, stuffing boxes, glands.
- .12 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .13 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .14 Verify lubricating oil levels.
- .5 Commissioning procedures - applicable to all Pool System Heat Exchangers:
  - .1 Check heat exchanger for cleanliness on primary and secondary sides.
  - .2 Check water treatment system is complete, operational and correct treatment is being applied.
  - .3 Check installation, settings, operation of relief valves and safety valves.
  - .4 Check installation, location, settings and operation of operating, limit and safety controls.
  - .5 Check supports, seismic restraint systems.
  - .6 Timing: only after TAB of hydronic systems have been successfully completed.
- .6 Training:
  - .1 Commission systems, perform tests in presence of, and using assistance of, assigned O&M personnel.
  - .2 Train O&M personnel in emergency shut down procedures.
- .7 Certificates:
  - .1 Upon completion, furnish certificates confirming satisfactory installation and performance.
- .8 Commissioning Reports:
  - .1 To include system schematics, test results, test certificates, raw and treated water analyses, design criteria, all other data required by Engineer.
- .9 Commissioning activities during Warranty Period:
  - .1 Visit project at specified intervals after commissioning is satisfactorily completed to verify that performance remains as set during commissioning (more often as required until system stabilizes at required level of performance). Submit written report to Engineer.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used

Commissioning  
Requirements – Mechanical

---

**Part 3          Execution**

**3.1              NOT USED**

.1          Not Used

**END OF SECTION**

Commissioning  
Requirements – Electrical

---

**Part 1 General**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Specific requirements relating to commissioning of the project's electrical components and systems. Refer to section 01 91 13 for general commissioning requirements
- .2 Related Sections:
  - .1 Specific start-up and testing requirements identified in specification sections applicable to all commissioned equipment and systems
  - .2 Section 01 91 13 – General Commissioning Requirements
  - .3 Section 23 08 00 – Commissioning – Mechanical
  - .4 Section 01 91 31 – General Commissioning Plan
  - .5 Section 01 91 41 – Commissioning Training
- .3 Acronyms:
  - .1 Cx – Commissioning
  - .2 CxA – Commissioning Authority
  - .3 EMCS – Energy Monitoring and Control Systems
  - .4 O&M – Operation and Maintenance
  - .5 IV – Installation Verification
  - .6 PV – Performance Verification (Functional Testing)
  - .7 TAB – Testing, Adjusting and Balancing

**1.2 SYSTEMS TO BE COMMISSIONED**

- .1 Electrical systems shall include but is not limited to the following:
  - .1 Incoming Electrical Service;
  - .2 Electrical Main Distribution;
  - .3 Electrical Branch Distribution;
  - .4 Information technology and communication systems;
  - .5 Emergency/exit lighting;
  - .6 Lighting/lighting controls;
  - .7 Fire alarm & fire detection;
  - .8 Essential electrical systems.

**1.3 TESTING FOR ELECTRICAL SYSTEMS PRIOR TO PV**

- .1 All systems as specified in the Electrical specification sections.

Commissioning  
Requirements – Electrical

---

- .2 Test and commission equipment and system as per Electrical Specification, CSA Z318.0-05, CSA Z8001-13, CSA Z32-15, CSA C22.1-15, CSA C282-15 and the following requirements.
- .3 Contractor to submit test reports for the test procedures, results of all items inspected, checked, measured and tested prior to PV. Comments and deficiencies should also be noted in the reports.
- .4 Low voltage switchboard (below 750V): Manufacturer/ITPTA shall carry out the following pre-service tests.
  - .1 All pre-service checks, inspections and testing as recommended by the manufacturer.
  - .2 Check and record nameplate data.
  - .3 Check and inspect the switchboard that it is installed in accordance with the manufacturer's recommendations and to the Code requirements.
  - .4 Check the installation is complete and is ready and safe to carry out the testing.
  - .5 Check and report the switchboard enclosure is suitable for the environment in which it is installed.
  - .6 Check and test grounding is completed and satisfactory prior to carrying out any test.
  - .7 Check and record the entire switchboard is clean and free of debris before the testing.
  - .8 Check the mechanical operation of the switches or breakers.
  - .9 Check all connecting bolts are tightened to the correct torque values.
  - .10 Megger test
  - .11 Set all protective devices to the settings as per the reviewed Coordination Study.
  - .12 Check all the indication lights and control switches for correct functions.
  - .13 Set up, check and test the proper operations of the TVSS, measuring, indicating and recording meters.
  - .14 After the board is energized, check and test phase sequence, the available voltages and load on the system and each feeder. For multi-section boards with different sources, check the phase sequence, available voltage and the polarity of each source.
- .5 Low voltage motor control centres (MCC): Manufacturer shall carry out the following pre-service tests and measurements after the board is energized.
  - .1 All pre-service checks, inspections and testing as recommended by the manufacturer.
  - .2 Check and record nameplate data.
  - .3 Check and inspect the MCC to ensure they are installed in accordance with the manufacturer's recommendations and to the Code requirements.
  - .4 Check the installation is complete and is ready and safe to carry out the testing.

Commissioning  
Requirements – Electrical

---

- .5 Check and report the MCC enclosure is suitable for the environment in which it is installed.
- .6 Check and test grounding is completed and satisfactory prior to carrying out any test.
- .7 Check and record the entire MCC is clean and free of debris before the testing.
- .8 Check the mechanical operation of the switches or breakers.
- .9 Check all connecting bolts are tightened to the correct torque values.
- .10 Megger test
- .11 Set all protective devices to the settings as per the reviewed Coordination Study.
- .12 Check and record the size of all fused switches and fuses.
- .13 Check, set and record the rating and setting of the overload relays.
- .14 Check all the indication lights and control switches for correct functions.
- .15 Check all control functions for proper functioning and connections.
- .16 Check all interface contacts for control and indications for proper functioning and connections.
- .17 Set up, check and test the proper operations of the TVSS, measuring, indicating and recording meters.
- .18 After the MCC is energized, check and test phase sequence and the available voltages.
- .19 Check motor running current and for correct rotation.
- .20 Submit start-up reports for all controlled motors (VFD).
- .6 Low voltage Distribution cables (below 750V): Contractor/Independent Third Party Testing Agent shall carry out the following tests:
  - .1 Check cables are properly installed, terminated and tightened to the correct torque values.
  - .2 Check and record cable sizes, types and method of installation.
  - .3 Check and confirm the installed cable sizes are of adequate rating, taking into consideration of the type of cable, the method of installation, the correction factors and any other requirements.
  - .4 Grounding test to ensure the equipment, the conduit and the cable armour/sheath, if applicable, are properly grounded.
  - .5 Megger test.
  - .6 Check and measure voltage and current under typical building load conditions (once other systems are commissioned and running). For cables in parallel, measure load current on each cable.
- .7 Emergency Generator/Automatic Transfer Switches: Contractor/Independent Third Party Testing Agent/Manufacturer shall carry out the following tests:
  - .1 Verify the product used meets the requirements of the electrical specifications and complies with the shop drawings.
  - .2 Confirm that all conductors are properly sized, terminated and torqued and marked with red lacquer.

Commissioning  
Requirements – Electrical

---

- .3 Perform tests (as applicable) that are required by the CEC, Specifications, Manufacturer, Owner, User, or the Design Consultant.
- .8 Transformers (below 750V): Independent Third Party Testing Agent or manufacturer shall carry out following tests:
  - .1 Check and record nameplate data.
  - .2 Check and report the transformer enclosure is suitable for the environment in which it is installed.
  - .3 Check and record sizes and types of primary and secondary protection devices, conductor sizes and types.
  - .4 Check cables are properly installed, terminated and tightened to the correct torque values.
  - .5 Megger the primary and secondary windings.
  - .6 Measure the primary and secondary winding resistances.
  - .7 Grounding test to ensure transformer is properly grounded.
  - .8 Polarity and phase sequence tests.
  - .9 Sound level test for different points at 1 m (3') away from transformers.
  - .10 Check and record transformer primary and secondary voltages and load current under typical load conditions. Check and record transformer on-load temperatures.
- .9 Central Lighting Inverters: Manufacturer shall perform tests to the specification, CSA C22.2 No. 141-15 and the following requirements:
  - .1 Prior to carrying out site test, the following items must be completed:
    - .1 The complete installation, must be completed, properly set and tested, and report submit. Report to include all settings.
    - .2 Test procedures submitted and reviewed by Engineer and CxA.
    - .3 Factory test report submitted and reviewed by Engineer and CxA.
  - .2 Check and record nameplate data.
  - .3 Verify the room conditions, such as temperature and humidity is within the range as recommended by the central lighting inverter manufacturer.
  - .4 Check cables are properly installed, terminated and tightened to the correct torque values.
  - .5 Check and test grounding system to ensure the unit, switchboard, panels and the associated equipment is properly grounded.
  - .6 Test all protective devices for proper shutdown and warning operations.
  - .7 Perform 100% full load test on the central lighting inverter for 30 minutes and one hour on the bypass circuit. Record all electrical data and the room temperatures. Measure and record battery voltages before and after the full load test.
  - .8 Measure and record input and output voltage, current, harmonic performance for each test.
  - .9 0-100% and 100%-0% step load transient test on normal power available and battery supply only.
  - .10 Battery discharge test to verify the specified performance requirements.

Commissioning  
Requirements – Electrical

---

- .11 manufacturer to provide a full site test report recording all the tests carried out, the results, including the results of the operation of the associated electrical and mechanical systems. The records must also include all settings in the Central Lighting Inverter. All deficiencies are also to be noted.
- .10 Distribution panel boards and branch panel boards: Contractor/ Independent Third Party Agent shall carry out following tests:
  - .1 Check and record nameplate data.
  - .2 Check and report the panel enclosure is suitable for the environment in which it is installed.
  - .3 Check cables are properly installed, terminated and tightened to the correct torque values.
  - .4 Check and test to verify the panel board directory is correct.
  - .5 Include the directory in the test records. The directory shall contain size of each breaker, equipment served, cable type and size.
  - .6 Check and test the voltage drop is within the specify limit from the service entrance switchboard to the distribution panels and branch panel boards.
  - .7 Test branch circuits voltage drop is within the requirements.
  - .8 Grounding test to ensure panel boards are properly grounded.
  - .9 Megger test.
  - .10 Measure voltage and load current on each phase under typical building load conditions. Submit test reports to Engineer and CxA. When required, re-arrange branch circuits as directed by the Engineer for proper load balancing.
  - .11 Provide thermographic scans of all distribution and branch panel boards under typical load conditions. Submit report including thermographic image of each panel. Images to be identified with the panel name, image date, and colour scale.
- .11 Coordination study:
  - .1 Independent Third Party Testing Agent shall, in accordance with the reviewed Coordination Study, set up all the protective devices, check and verify the rating and types of fuses and record all such ratings and settings in his reports.
- .12 Lighting and Lighting Control systems: Manufacturer and Contractor shall carry out the following tests:
  - .1 Prior to carrying out site test, submit a lighting system operation matrix to the Engineer and CxA. Matrix to show the zoning layout, how each zone is controlled, and the settings, such as timer and sensor settings for each zone.
  - .2 Check and verify all lighting fixtures are connected and switched properly.
  - .3 Check and verify all automatic controls are connected and functioning properly. Cooperate with EMCS contractor to field verify lighting integration with the EMCS.
  - .4 Check and verify all operations shown in the matrix.

Commissioning  
Requirements – Electrical

---

- .5 Check and verify the emergency lighting system, including battery lighting system, are connected and functioning properly.
- .6 Carry out lighting level tests as required and directed by the Commissioning Authority.
- .13 Fire Alarm System: Manufacturer and/or Independent Third Party Testing Agent shall carry out following tests:
  - .1 Prior to carrying out site test, submit a fire alarm system operation matrix to the Engineer and CxA. This matrix shall include of operation of the fire alarm system and the operations of all systems interfaced with the fire alarm system.
  - .2 Check and record nameplate data.
  - .3 Check and report the panel enclosure is suitable for the environment in which it is installed.
  - .4 Check and verify system is installed to specification, NBC, and S524 requirements.
  - .5 Perform system verifications and tests according to CAN/ULC-S537.
  - .6 Check and verify all system operations shown in the matrix.
  - .7 Perform system integration test to verify proper fire alarm system operation, and the proper operations of all systems interfaced with the fire alarm system.
  - .8 Demonstrate all devices and zones to CxA.
  - .9 Submit verification reports and system operation verification reports to CxA.
- .14 CCTV, Security, Access Control and all other Communication Systems: Manufacturer shall carry out following tests:
  - .1 Prior to carrying out site test, submit
    - .1 System operation matrix to the Engineer and CxA. This matrix shall include of operation of the system and the operations of all interfaced systems;
    - .2 Test procedures to detail what tests and how each test will be carried out. Procedure to include how the system operation will be commissioned.
  - .2 Check and record nameplate data.
  - .3 Check and report the panel enclosure is suitable for the environment in which it is installed.
  - .4 Check and verify the operation of each device.
  - .5 Check and verify all system operations shown in the matrix.
  - .6 Perform system integration test to verify proper system operation, and the proper operations of all interfaced systems.
  - .7 Submit report to include the system operation matrix, test procedures, system settings and all the test results, comments and list of deficiencies.

Commissioning  
Requirements – Electrical

---

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Related Sections**

- .1 Excavating, Trenching, and Backfilling: Section 31.23.33

### **1.2 Definitions**

- 1. Clearing: cutting, chipping and disposal of all designated trees and brush within site boundary and other areas as indicated including felled trees, previously up-rooted trees, and surface debris.
- .2 Grubbing: excavation and disposal, removal of all stumps, roots, embedded timber, rock fragment, humus, rootmat and topsoil.

## **PART 2- PRODUCTS**

### **2.1 Not applicable to this Section.**

## **PART 3- EXECUTION**

### **3.1 General**

- .1 Comply with conditions of all permits.
- .2 Do not remove trees or brush from outside limits indicated except for any tree or branch considered unsafe.
- .3 Cut trees and brush close to ground leaving no stump higher than 300mm.
- .4 Grub out stumps and roots to not less than 200mm below ground surface.
- .5 Grub out visible rock fragments and boulders, greater than 300mm in greater dimension, but less than 0.25 m<sup>3</sup>.
- .6 Where on-site reuse is approved, ensure that the area is graded and landscaped to blend with other site features to the approval of the Province.

### **3.2 Removal and Disposal**

- .1 Remove cleared and grubbed material off-site. The off-site disposal of grubbing will be at the discretion of the DTIR Representative.
- .2 If permitted, chip or mulch and stockpile or spread vegetation matter on-site as directed.
- .3 Chips are to be disposed of where they will not wash into a watercourse or block ditches, culverts or drains.

Clearing and Grubbing

---

- .4 In accordance with best ecological practice, wood chips should be spread in wooded areas to create a neat, natural appearance, maximum depth of 100mm. If this is not feasible, wood chips should be removed from the site and disposed of in accordance with regulatory requirements.
- .5 Dispose of unusable chip and slash at a licensed facility.

### **3.3 Finished Surfaces**

- .1 Leave ground surface suitable for immediate grading operation.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 General**

- .1 Provide and maintain sediment control fence where required or as directed, prior to construction. Co-ordinate locations with Engineer. Do not remove control features until authorized by the Engineer.
- .2 Provide and maintain sediment control berms where required or as directed, prior to construction. Co-ordinate locations with Engineer. Do not remove control features until authorized by the Engineer.

## **PART 2- PRODUCTS**

### **2.1 Sediment Control Fence**

- .1 Sediment Control fence: preassembled sediment control fence with industrial woven geotextile fabric pre-stapled to wood posts spaced as indicated.

### **2.2 Dust Control**

- .1 Materials:
  - .1 Calcium chloride, Type I, to CAN/CGSB 15.1, flake, 35% aqueous solution.
  - .2 Water: to Engineer's approval.

## **PART 3- EXECUTION**

### **3.1 Temporary Soil Covers**

- .1 If blown straw or hay is to be used as temporary soil cover, a 100% cover is required to ensure soil erosion is minimized.
- .2 Where blown straw or hay is used as mulch to protect new seeding, control the thickness of the application to avoid smothering of the seed. If used in lieu of environmental blanket, uniformly apply straw and hay blown onto the seeded areas. Thickness would depend on site conditions, seed mix, slope and soil type.

### **3.2 Sediment Control Fence**

- .1 Attach fence with staples. Provide wood strapping along top of fence.
- .2 Excavate 100mm x 100mm trench along length of fence or as indicated by Project Documents. Lay fabric bottom in trench and backfill with selected excavated material.

Erosion and Sediment Control

---

**3.3 Maintenance of Silt Fence**

- .1 Maintain siltation control features throughout the construction period. Repair damage to original condition.
- .2 Remove accumulated sediment from behind silt fence. Remove silt fence when and as directed by the Engineer.
- .3 Maintain vertical alignment of silt fence such that it is always plumb and straight.

**3.4 Drainage**

- .1 Do not pump or drain water containing suspended materials (except as required by bypass pumping of sanitary sewage) into waterways, sewer or drainage systems.
- .2 Bypass pumping of sanitary sewage may only be discharged into an existing sanitary sewage sewer system.

**3.5 Catchbasin Filtration**

- .1 Install sediment traps on all existing catch basins to ensure sediment does not enter stormwater system.

**3.6 Dust Control**

- .1 Deliver calcium chloride to site in moisture-proof bags. Indicate name of manufacturer, name of product, net weight or mass and percentage of calcium chloride guaranteed by manufacturer.
- .2 Store bags of calcium chloride in weather-proof enclosures.
- .3 Apply calcium chloride and water for alleviation and prevention of dust nuisance caused by equipment and traffic movement when directed by the Engineer.
- .4 Apply calcium chloride and water with equipment approved by the Engineer, at a rate and in locations approved by the Engineer.
- .5 Apply water in areas where use of calcium chloride is not permitted. Use distributors equipped with spray system that will promote uniform application and with means of shut-off.

**END OF SECTION**

## **PART 1- GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Topsoil and finish grading.

### **1.2 Administrative Requirements**

- .1 Sequencing and scheduling:
  - .1 Schedule placing of topsoil and finish grading to permit sodding, seeding, planting operations within 5 days.

### **1.3 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Samples:
  - .1 Submit samples of soil.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Topsoil:
  - .1 Existing topsoil shall be stripped, covered, and stockpiled on site for fine grading. Imported topsoil will be required for planting depth according to plating details.
  - .2 Material subject to analysis by testing laboratory before use.
- .2 Imported topsoil for seeding and sodding:
  - .1 Fertile, friable, neither heavy clay nor of very light sandy nature containing minimum of 4% organic matter for clay loams and 2% for sandy loams to maximum of 20% by volume.
  - .2 Free from subsoil, roots, grass, weeds, toxic materials, stones, foreign object.
  - .3 Acidity range (pH) value shall be 5.5 to 7.5, plus commercial fertilizer recommended by the Soil Analyst.
  - .4 Topsoil containing crabgrass, couchgrass or noxious weeds is not acceptable.
  - .5 Source and quality of topsoil shall be acceptable to the *Consultant* subject to soil analysis and condition at time of placing.
- .3 Imported topsoil for planting: in accordance with Section 32 93 00.
- .4 Fertilizer:
  - .1 Complete commercial synthetic slow release fertilizer with maximum 35% water soluble nitrogen.
  - .2 Formulation ratio: 1:4:4.

## **PART 3 - EXECUTION**

### **3.1 Preparation**

- .1 Grade subgrade, eliminating uneven areas and low spots, ensuring positive drainage. Remove debris, roots, branches, stones in excess of 50 mm (2") diameter and other deleterious materials. Remove subsoil that has been contaminated with oil, gasoline or calcium chloride. Dispose of removed materials as directed.
- .2 Grade subgrade to uniform surface and remove vegetation which may interfere with sodding and planting operations. Loosen soil to depth of minimum 25 mm (1") and remove stones and foreign material which protrude more than 75 mm (3") above surface.

### **3.2 Spreading of Topsoil**

- .1 Do not spread topsoil until *Consultant* has inspected and approved subgrade.
- .2 Spread topsoil with adequate moisture in uniform layers during dry weather over approved, dry, and unfrozen subgrade.
- .3 Spread topsoil in to depths after settlement as indicated.
- .4 Remove stones, roots, grass, weeds, construction materials, debris and foreign non-organic objects from topsoil.

### **3.3 Application of Fertilizer**

- .1 Fertilizer to be added to seed mixture and applied hydraulically.
- .2 Mix fertilizer thoroughly into upper 50 mm (2") of topsoil.

### **3.4 Finish Grading**

- .1 Fine grade mechanically entire topsoiled area to smooth contours and elevations as directed. Eliminate rough spots and low areas to ensure positive drainage.
- .2 Roll topsoil with 50 kg (110 lbs) roller, minimum 914 mm (36") wide, to compact and retain surface.

### **3.5 Field Quality Control**

- .1 Field tests and inspections:
  - .1 Prepare random samples of existing topsoil and new topsoil to one of approved laboratories listed below, requesting analysis for NPK and minor values, soluble salt contents, organic matter, and pH value and recommendations for treatment of soils for seeding and sodding, and additives required to support vigorous growth. Test imported subsoil for substances detrimental to plants.
    - .1 Testing of soil to be carried about by Nova Scotia Department of Agriculture soils laboratory.
  - .2 Soil testing shall be carried out by an approved, independent inspection and testing agency.
  - .3 Arrange for, and be responsible for, all costs related to soil testing.
  - .4 Submit soil testing before commencing work.

Topsoil and Finish Grading

---

- .5 As part of this work, adjust fertilizer requirements adding other additives to conform to soil testing report recommendations.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Related Sections**

- .1 Granular Sub-base: Section 32 11 16
- .2 Aggregate Base Courses: Section 32 11 23
- .3 Asphalt Concrete Paving: Section 32 12 16
- .4 Concrete Walks, Curbs and Gutters: Section 32 16 15
- .5 Reinstatement: Section 32 98 00
- .6 Site Water Utility Distribution Piping: Section 33 11 16
- .7 Public Sanitary Sewerage Piping: Section 33 31 13
- .8 Precast Manholes, Catch Basins & Structures: Section 33 39 00
- .9 Storm Utility Drainage Piping: Section 33 41 00

### **1.2 References**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 117-13, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D 422-63 (2007), Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D 1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (600 kN-M/m<sup>3</sup>).
  - .6 ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 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 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-08, Cementitious Materials for Use in Concrete.

Excavating, Trenching, and Backfilling

---

- .2 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
- .5 Nova Scotia Transportation and Infrastructure Renewal (NSTIR)
  - .1 Standard Specification for Highway Construction and Maintenance, Latest Edition.
- .6 Nova Scotia Environment (NSE)
  - .1 Nova Scotia Watercourse Alteration Specifications, Latest Edition.
  - .2 Nova Scotia Watercourse Alteration Certification Training Manual, Latest Edition.

### 1.3 Definitions

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock: solid material in excess of 0.5 cubic meters and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 cubic meter bucket. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Topsoil: as defined in specification section 31 22 19 Topsoil and Finish Grading.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.1.
  - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100

Excavating, Trenching, and Backfilling

---

0.02 mm	10 - 80
0.005 mm	0 - 45

- .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .6 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

#### 1.4 Submittals

- .1 Quality Control: in accordance with Section 01 45 00 - Quality Control:
  - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
  - .2 Submit for review by the Engineer proposed dewatering and heave prevention methods as described in PART 3 of this Section.
  - .3 Submit to the Engineer written notice at least 7 days prior to excavation work.
  - .4 Submit to the Engineer testing and inspection results and report as described in PART 3 of this Section.
- .2 Preconstruction Submittals:
  - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
  - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, and/or location plan of relocated and abandoned services, as required.
- .3 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Inform the Engineer at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
  - .3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
  - .4 Ship samples prepaid to the Engineer, in tightly closed containers to prevent contamination and exposure to elements.

#### 1.5 Quality Assurance

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Keep design and supporting data on site.

Excavating, Trenching, and Backfilling

---

- .3 Do not use soil material until written report of soil test results are reviewed and approved by the Engineer.
- .4 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with local standards.

## **1.6 Waste Management and Disposal**

- .1 Divert excess aggregate materials from landfill to local facility for reuse as directed by the Engineer.

## **1.7 Existing Conditions**

- .1 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .5 Prior to beginning excavation Work, notify the Engineer and authorities having jurisdiction and establish location and state of use of buried utilities and structures.
  - .6 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods.
  - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .8 Where utility lines or structures exist in area of excavation, obtain direction of the Engineer before removing or re-routing.
  - .9 Record location of maintained, re-routed and abandoned underground lines.
  - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
  - .1 Conduct, with the Engineer, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by the Engineer.

Excavating, Trenching, and Backfilling

---

## PART 2- PRODUCTS

### 2.1 Materials

- .1 All granular materials shall be non-ore bearing.
- .2 Type 1 granular material: Type 1 gravel in accordance with NSTIR's Standard Specifications for Highway Construction and Maintenance.
- .3 Type 2 granular material: Type 2 gravel material in accordance with NSTIR's Standard Specifications for Highway Construction and Maintenance.
- .4 Backfill material: selected material approved by the Engineer for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .5 Engineered Rock Fill: Select Rock Fill approved by the Owner's Geotechnical Engineer. Material shall be unfrozen, with a maximum particle size of 200mm and free from cinders, ashes, sods, refuse or other deleterious materials. The material shall be well graded and have a fines content less than 10% and be suitable for road construction. Acid bearing material is not acceptable.
- .6 Type C3 free-draining material: Type C3 crushed clear stone in accordance with NSTIR's Standard Specifications for Highway Construction and Maintenance.
- .7 Type C5 foundation drain clear stone: Type C5 crushed clear stone in accordance with NSTIR's Standard Specifications for Highway Construction and Maintenance.
- .8 Surge Fill: well-graded granular material, maximum particle size not to exceed 100 mm and fines content not to exceed 5%.
- .9 Sand: hard, granular sharp material, well graded from coarse to fine, free of impurities, chemicals or organic matter, and graded as follows:

<u>Sieve Designation</u>	<u>Percent Passing</u>
5mm	100
0.16mm	0 - 5

- .10 Crusher Dust: Crushed aggregate; hard, durable angular particles, free from clay lumps, cementation, organic matter, frozen material and other foreign materials.

<u>Sieve Designation</u>	<u>Percent Passing</u>
5mm	100
2.2mm	63 - 73
0.90 mm	40 - 50

Excavating, Trenching, and Backfilling

---

0.40 mm	25 - 35
0.16mm	13 - 21

## **PART 3- EXECUTION**

### **3.1 Temporary Erosion and Sediment Control**

- .1 Provide 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 requirements of authorities having jurisdiction.
- .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.

### **3.2 Site Preparation**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement neatly and in straight lines along limits of proposed excavation in order that surface may break evenly and cleanly.

### **3.3 Preparation/Protection**

- .1 Protect existing features in accordance with applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Engineer approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

### **3.4 Stockpiling**

- .1 Stockpile fill materials in areas designated by the Engineer.
  - .1 Stockpile granular materials in manner to prevent segregation and increases in moisture content.
- .2 Protect fill materials from contamination.

Excavating, Trenching, and Backfilling

---

- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

### **3.5 Cofferdams, Shoring, Bracing, and Underpinning**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with the latest edition of the Occupational Health and Safety Act for the Province of Nova Scotia.
  - .1 Where conditions are unstable, Engineer to verify and advise methods.
- .2 Construct temporary Works to depths, heights and locations as approved by the Engineer.
- .3 During backfill operation:
  - .1 Unless otherwise indicated or directed by the Engineer, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .5 Upon completion of substructure construction:
  - .1 Remove cofferdams, shoring and bracing.
  - .2 Remove excess materials from site and restore watercourses as directed by the Engineer.

### **3.6 Dewatering and Heave Protection**

- .1 Keep excavations free of water while Work is in progress.
- .2 Dewatering can be accomplished through the use of sump pits installed below the proposed excavation depth or the installation of well points. Both these dewatering methods should be installed PRIOR to commencing the excavation.
- .3 . Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
  - .2 If this is suspected, advise the Engineer and await further instruction.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with local standards to approved collection and in manner not detrimental to public and private property, or portion of Work completed or under construction.

Excavating, Trenching, and Backfilling

---

### **3.7 Excavation**

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Excavation must not interfere with bearing capacity of adjacent foundations.
- .3 For trench excavation, unless otherwise authorized by the Engineer in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .4 Any soft spots should be removed and replaced with compacted Surge fill or Type 2 granular material.
- .5 Correct unauthorized over-excavation as follows:
  - .1 Fill under bearing surfaces, footings, structural elements, gravel surfaces and paved areas with Surge fill or Type 2 granular material compacted to not less than 100% of maximum dry density to ASTM D698 or 80% relative density and placed in lifts compatible with the compaction equipment used (lifts not to exceed 300 mm thickness).
  - .2 Fill in trenches with Type 2 fill compacted to not less than 98% maximum dry density to ASTM D698 and placed in lifts compatible with the compaction equipment used (lifts not to exceed 300 mm thickness).
  - .3 Under landscaped areas, place backfill material in lifts not exceeding 300 mm thickness and compact to 95% maximum dry density to ASTM D698.
- .6 Rock excavation is included in the contract.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by the Engineer.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus, unsuitable and waste excavated material off site unless otherwise indicated by the Project Documents.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify the Engineer when bottom of excavation is reached.
- .13 Obtain Engineer approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by the Engineer.
- .15 Hand trim, make firm and remove loose material and debris from excavations.

Excavating, Trenching, and Backfilling

---

- .1 Clean out rock seams and fill with concrete mortar or grout to approval of the Engineer.

### 3.8 Fill Types and Compaction

- .1 Use types of fill as indicated or specified below.
  - .1 Under roadway: Sub-grade to be constructed using approved on-site soils, engineered fill, or imported quarried rockfill and gravel or sand and gravel pit run to be proof rolled with a minimum of 3 passes with a 10 tonne vibrating roller. Granular base and sub-base placed as indicated on drawings in lifts compatible with the compaction equipment used (lifts not to exceed 300 mm thickness). Compact fill below 300mm of paved areas to 95% SPD and 98% within 300mm of paved area subgrade.
  - .2 Under landscaped areas: Backfill material. Place in lifts compatible with the compaction equipment used (lifts not to exceed 300 mm thickness). Compact each lift to 95% Standard Proctor Density.
  - .3 Utility trenches:
    - .1 Backfill under bearing surfaces, roadways and parking areas: Surge fill or Type 2 granular material placed in lifts compatible with compaction equipment (not to exceed 300 mm). Compact each lift to 100% maximum dry density to ASTM D698.
    - .2 Backfill under landscaped areas: Backfill material. Placed in lifts compatible with compaction equipment (not to exceed 300 mm). Compact each lift to 95% maximum dry density to ASTM D698.
  - .4 Outside of retaining walls: In all areas where interior finished floor is lower than exterior grade backfilling should consist of a granular wedge within a zone bounded by the edge of footing and a line drawing upwards and outwards at 45 degrees from the base of the wall. Granular edge to be constructed with Type 2 compacted to 100% Standard Proctor Density
  - .5 Under building slab: Slab on grade to be founded on approved undisturbed sub-grade or structural fill. Structural Fill to be approved on-site soils or imported quarried rockfill and gravel or sand and gravel pit run. A 150mm thick layer of type 1 gravel to be placed below the floor slab for levelling and support purposes. All fill in building areas shall be compacted to 100% standard proctor density.
  - .6 Against foundation walls: first 300mm of material placed against foundation wall to be 30mm clear stone to facilitate drainage to footing drains.

### 3.9 Backfilling

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Engineer has inspected and approved installations.
  - .2 Engineer has inspected and approved of construction below finish grade.
  - .3 Removal of concrete formwork.
  - .4 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

Excavating, Trenching, and Backfilling

---

- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in lifts compactible with the compaction equipment used (lifts not to exceed 300 mm thickness). Compact each layer before placing succeeding layer.
- .5 Place backfill in accordance with Section 3.8 FILL TYPES AND COMPACTION.
- .6 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading.
  - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
    - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from the Engineer or:
    - .2 If approved by the Engineer, erect bracing or shoring to counter act unbalance, and leave in place until removal is approved by the Engineer.

### **3.10 Mass Excavation and Embankment**

- .1 Establish with Engineer lead time required to take measurements. Notify Engineer in accordance with agreed lead time.
- .2 Excavate and place fill to lines and grades indicated.
- .3 Maintain crowns and cross slopes to provide surface drainage.
- .4 When rock, or unsuitable material is encountered notify Engineer for measurement.
- .5 Break rock to depth 300mm below subgrade. Excavate broken rock to subgrade or as indicated by project documents. Remove loose rock fragments from slopes.
- .6 Remove existing pavement encountered within 300mm of subgrade elevation.
- .7 Do not place material which is frozen or place material on frozen surfaces.
- .8 When constructing embankment with common material place in uniform layers to full width of embankment. Compaction as outlined in Section 3.8 Fill Types and Compaction.
- .9 When constructing embankment with rock fill, place to full width of embankment in layers of sufficient depth to contain maximum sized rocks, but in no case is thickness to exceed 1m. Fill interstices with rock fragments or earth to form compact mass. Fill voids at subgrade level to prevent migration of fine material.

Excavating, Trenching, and Backfilling

---

- .10 Do not place boulders or broken rock fragments with dimensions greater than 200mm within 300mm of subgrade.
- .11 Shape and compact material to within 40mm of design subgrade elevation, but not uniformly high or low.
- .12 Finish side slopes uniformly to lines and elevations indicated. Remove boulders encountered in cut slopes and fill resulting cavities.

### **3.11 Breaking Rock without removal**

- .1 Break Rock without removal to lines and grades indicated.
- .2 Break rock below street subgrade such that maximum dimension of rock fragments within 300mm of subgrade is 200mm.
- .3 Break Rock for future removal as follows:
  - .1 Mass: maximum size of 90 percent of volume of rock broken is less than 0.5 cubic meters with no fragments exceeding one cubic meter.
  - .2 Trench: Maximum size of 90 percent of volume of rock broken is less than 0.3 cubic meters with no fragments to exceed 0.5 cubic meters.
- .4 Excavate broken rock to depth indicated at test locations selected by Engineer in accordance with following criteria:
  - .1 Mass: one test hole for each 1000 square meters of surface area with a minimum of one test hole in each location
  - .2 Trench: One test hole for each 30 meters along trench with minimum of one test hole at each separate trench.
- .5 Should test excavation indicate that breaking techniques do not give required results, do remedial work.
- .6 Backfill test excavations after inspection using excavated materials.

### **3.12 Road Gravels**

- .1 Prior to placing road gravels, grade surface to within 40mm of elevations and cross sections indicated but not uniformly high or low. Compact top 300mm to 98% Standard Proctor Density or as indicated in the Project Documents.
- .2 Place Gravels in uniform layers not exceeding 200mm to thickness indicated. Grade intermediate gravel courses to within 30mm of elevations and cross-sections indicated, but not uniformly high or low. Compact to 100% Standard Proctor Density or as indicated in the Project Documents.

### **3.13 Testing**

- .1 Submit testing procedure, frequency of tests, testing laboratory as designated by ULC or certified testing personnel to the Engineer for approval. Testing to be completed by Owner's Geotechnical Engineer.

### **3.14 Restoration**

- .1 Upon completion of Work, remove waste materials and debris and trim slopes, and correct defects as directed by the Engineer.
- .2 Replace topsoil as directed by the Engineer.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavements and curb disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by Work as directed by the Engineer.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Section Includes**

- .1 Materials and installation of polymeric geotextiles used in filtration, drainage structures and roadbeds, the purpose of which is to:
  - .1 Separate and prevent mixing of granular materials of different grading.
  - .2 Act as hydraulic filters permitting passage of water while retaining soil strength of granular structure.

### **1.2 Related Sections**

- .1 Submittal Procedures: Section 01 33 00
- .2 Excavating, Trenching and Backfilling: Section 31 23 33

### **1.3 References**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM D 4491-99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
  - .2 ASTM D 4595-11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - .3 ASTM D 4716-08(2013), Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
  - .4 ASTM D 4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-4.2 No. 11-.2-M89(November 2004), Textile Test Methods - Bursting Strength - Ball Burst Test (Reaffirmation of September 1989).
  - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
    - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
    - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
    - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
    - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
    - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

## Geotextiles

---

- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

### 1.4 Submittals

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to the Engineer the following samples at least 4 weeks prior to beginning Work.
  - .1 Minimum length of 2 m of roll width of geotextile.
  - .2 Minimum of 1 m seam with at least 300 mm of geotextile on both sides of seam.
- .3 Submit to the Engineer copies of mill test data and certificate at least 4 weeks prior to start of Work, and in accordance with Section 01 33 00 - Submittal Procedures.

### 1.5 DELIVERY, STORAGE AND HANDLING

- .1 During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

### 1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Fold up metal banding, flatten and place in designated area for recycling.

## PART 2 - PRODUCTS

### 2.1 Materials

- .1 Geotextile fabric under paved areas (for defective subgrade repairs) and rip-rap: non-woven synthetic fibre fabric, supplied in rolls.
  - .1 Composed of: minimum 85% by mass of polypropylene or polyester.
  - .2 Thickness: to CAN/CGSB-148.1, No.3, minimum 3 mm
  - .3 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 400 g/m<sup>2</sup>.
  - .4 Tensile strength and elongation (in any principal direction): to ASTM D 4595-11.
    - .1 Tensile strength: minimum 2,000 N, wet condition.

## Geotextiles

---

- .2 Elongation at break: minimum 70%.
- .3 Seam strength: equal to or greater than tensile strength of fabric.
- .4 Mullen burst strength: to CAN/CGSB-4.2, No.11.1, minimum 5,000 kPa wet conditions.
- .5 Apparent opening size (AOS): to ASTM D 4751-99a(2004), 0.10 to 0.18 mm.
- .2 Geotextile fabric for sub-drainage piping: non-woven synthetic fibre filter fabric, supplied in rolls.
  - .1 Composed of: minimum 85% by mass of polypropylene or polyester.
  - .2 Thickness: to CAN/CGSB-148.1, No.3, minimum 2 mm.
  - .3 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 210 g/m<sup>2</sup>.
  - .4 Tensile strength and elongation (in any principal direction ): to ASTM D 4595-11.
    - .1 Tensile strength: minimum 600 N, wet condition.
    - .2 Elongation at break: minimum 60%.
    - .3 Seam strength: equal to or greater than tensile strength of fabric.
    - .4 Mullen burst strength: to CAN/CGSB-4.2, No.11.1, minimum 1,200 kPa wet conditions.
  - .5 Apparent opening size (AOS): to ASTM D 4751-11, 0.14 to 0.22 mm.
- .3 Backfill Materials:
  - .1 In accordance with details on Contract Documents.
  - .2 Securing pins and washers: to CAN/CSA-G40.21-04, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m<sup>2</sup> to CAN/CSA G164-M92(R2003).
  - .3 Factory seams: sewn in accordance with manufacturer's recommendations.
  - .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

## PART 3 – EXECUTION

### 3.1 Installation

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Join successive strips of geotextile by sewing.

## Geotextiles

---

- .6 Pin successive strips of geotextile with securing pins.
- .7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .8 After installation, cover with overlying layer within 4 hours of placement.
- .9 Replace damaged or deteriorated geotextile to the satisfaction of the Engineer.
- .10 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.

### **3.2 Cleaning**

- .1 Remove construction debris from Project site and dispose of debris in an environmentally responsible and legal manner.

### **3.3 Protection**

- .1 Vehicular traffic not permitted directly on geotextile.

**END OF SECTION**

Temporary Tree and Plant Protection

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 This section includes the protection of existing trees that interfere with, or are affected by, execution of the *Work*, whether temporary or permanent construction.

### **1.2 Administrative Requirements**

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
  - .1 Before tree protection and trimming operations begin, meet with representatives of authorities having jurisdiction, *Owner*, *Consultant*, landscape architect, and other concerned entities to review tree protection and trimming procedures and responsibilities.

### **1.3 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Samples:
  - .1 Submit a sample of tree protection barrier (orange safety fence).

### **1.4 Quality Assurance**

- .1 Qualifications: An experienced tree service firm, minimum 5 years experience, that has successfully completed tree protection and trimming work similar to that required for this *Project* and that will assign an experienced, qualified arborist to *Project* and present at the *Place of the Work* during execution of tree protection and trimming.

## **PART 2- PRODUCTS**

### **2.1 Materials**

- .1 Products and remedial care for protection of the trees and plants as specified are to be as recommended by a qualified arborist, must comply with references above, with approval of the *Consultant*.
- .2 Provide tree protection barrier alternative where indicated on the drawings:
  - .1 Snow fencing to be standard 1220 mm (48") high orange safety fence, and 'T' iron rail stakes (38 mm (1-1/2") x 38 mm (1-1/2") x 5 mm (13/64")) primed with one coat of black zinc rich paint.
- .3 Mulch: Clean, straw mulch from local sources free of weeds and hazardous materials.

## **PART 3 - EXECUTION**

### **3.1 Examination**

- .1 Examine the *Place of the Work* before commencement of work and inform *Consultant* if site conditions will not permit completion of tree and plant protection work as in accordance with the *Contract Documents*.

### Temporary Tree and Plant Protection

---

- .2 No groundbreaking activities or demolition should occur until all tree preservation requirements have been met.
- .3 All *Subcontractors*, *Suppliers*, and site personnel shall be informed of the tree and plant protection measures and guidelines prior to their commencing any activities at the *Place of the Work*.
- .4 Refer to tree protection plan and tree protection detail on landscape drawings.
- .5 The Tree Protection Zone (TPZ) shall be posted with signs.
- .6 Within the Tree Preservation Zone (TPZ) there shall be:
  - .1 no construction;
  - .2 no altering of grade by adding fill, excavating, trenching, scraping, dumping or disturbance of any kind.
  - .3 no storage of construction materials, equipment, soil, construction waste or debris.
  - .4 no disposal of any liquids (ie: concrete sleuth, gas, oil, paint).
  - .5 no movement of vehicles, equipment or pedestrians.
  - .6 no parking of vehicles or machinery.
  - .7 No activity of any kind without permission of the arborist
  - .8 Activity of any kind without permission of the arborist

### 3.2 Tree Protection

- .1 Protect trees to be preserved from damage during the *Work* in accordance with the following specifications and make good any damage at no expense to *Owner*.
- .2 The location of the tree preservation zone is clearly indicated on the Tree Preservation Plan. Trees to be protected will be confirmed by the *Consultant*.
- .3 Tree protection shall remain in place until all sitework has been completed, and may not be removed, relocated, or otherwise altered without the written permission of the *Consultant*.
- .4 The trees to be protected shall be fertilized with a deep root application of an approved fertilizer before construction commences on this project as well as a second fertilization in two years.
- .5 The arborist shall undertake proper root pruning when and if roots of retained trees are to be exposed, damaged or severed by construction activities. The arborist shall supervise the excavation of soil where roots are to be cut. All roots are to be cut cleanly at the excavation zone and backfilled with an appropriate soil mix. Exposed roots shall be covered with soil or mulch as soon as possible to prevent further damage and desiccation. Root pruning prior to excavation will help prevent unnecessary damage to tree roots.
- .6 In areas where mulch may remain following construction the trees shall have minimum 100 mm (4") of mulch installed over the root system before construction starts, and set back from the trunk by rodent guard. Mulch shall be spread evenly under the canopy to the dripline, to the limits of the protection fence, or as otherwise indicated in the *Contract Documents*.

---

Temporary Tree and Plant Protection

---

- .7 There shall be a source of water provided to ensure that the trees get adequate water during the dry periods. It will be the responsibility of the *Contractor* to monitor for moisture content in the soil for the duration of the *Work*.
- .8 The protection zone shall not be breached in any way. There shall be no material stored in the preservation zones, no grade changes and no parking.
- .9 Ensure all trees are protected from compaction of roots or damage to trunk or limbs prior to receipt of permits for removal or remedial care as recommended by arborist.
- .10 Obtain necessary permits, reports, and approvals.
- .11 Proceed with execution of specified work, under direction of the *Consultant*.
- .12 No rigging cables will be wrapped around or installed in trees. Do not burn waste near trees and do not flush concrete trucks or cement mixing machines over root system.

### 3.3 Tree Compensation

- .1 The *Contractor* shall be held responsible for all trees that have been damaged or have died as a result of his own actions. The *Contractor* shall reimburse the *Owner* at the *Contractor's* own expense for damaged or dead trees.
- .2 Trees and Tree Protection Zones (TPZ's) shall be regularly monitored by consulting arborist throughout the duration of the project.
- .3 If injury shall occur to trees during construction, the consulting arborist shall be notified immediately and shall evaluate the trees immediately so that appropriate treatment can be performed in a timely manner.

### 3.4 Tree Repair and Replacement

- .1 Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
- .2 Remove and replace trees indicated to remain that die or are damaged during construction operations that *Consultant* and arborist determine are incapable or restoring to normal growth pattern.
  - .1 Provide new trees of same size and species as those being replaced; plant and maintain as specified by *Consultant*.
  - .2 Provide new trees of 150 mm (6") calliper size and of a species selected by *Consultant* when damaged trees more than 150 mm (6") in calliper size, measured 305 mm (12") above grade , are required to be replaced. Plant and maintain new trees as specified by *Consultant*.
- .3 Aerate surface soil, compacted during construction, 3048 mm (10 ft) beyond drip line and no closer than 914 mm (36") to tree trunk. Drill 50 mm (2") diameter holes a minimum of 305 mm (12") deep at 610 mm (24") on centre. Backfill holes with an equal mix of augured soil and sand.
- .4 General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicative existing tree to be replaced. Comply with ANSI Z60.1-2014; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in lead and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

Temporary Tree and Plant Protection

---

- .1 Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk, crossing trunks; cut-off limbs more than 19 mm (3/4") in diameter; or with stem girdling roots will be rejected.
- .2 Collected Stock: Do not use plants harvested from the wild, from native stands, from an established planting, or not grown in a nursery unless otherwise indicated.
- .5 Provide trees of sizes, grades, and all sizes complying with ANSI Z60.1-2014 for types and form of trees required. Plants of a larger size may be used if acceptable to Landscape Architect, with a proportionate increase in size of roots or balls.
- .6 Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1-2014. Root flare shall be visible before planting.

**3.5 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00.

**END OF SECTION**

Granular Subbase

---

## **PART 1 – GENERAL**

### **1.1 Related Sections**

- .1 Excavating, Trenching and Backfilling: Section 31 23 33

### **1.2 References**

- .1 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification, Highway Construction and Maintenance, Latest Edition.
- .2 American Society for Testing and Materials (ASTM)
  - .1 ASTM C 117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D 422-63(R2007), Standard Test Method for Particle-Size Analysis of Soils.
  - .5 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .6 ASTM D 1557-12, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
  - .7 ASTM D 1883-05, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .8 .ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .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.

### **1.3 Waste Management and Disposal**

- .1 Separate and recycle waste materials
- .2 Divert unused granular material from landfill to local facility to the satisfaction of the Engineer.

## **PART 2 – PRODUCTS**

### **2.1 Materials**

- .1 Granular sub-base material: in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling, and as indicated on drawings.

Granular Subbase

---

## **PART 3 – EXECUTION**

### **3.1 Placing**

- .1 Place granular sub-base after sub-grade is to the satisfaction of the Engineer.
- .2 Construct granular sub-base to depth 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 Place material to full width in uniform layers. Lift thickness to be compatible with the compaction equipment used.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace portion of layer in which material has become segregated during spreading.

### **3.2 Compaction**

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to densities in accordance with Project Documents.
- .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 to the satisfaction of the Engineer.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### **3.3 Quality Control Testing**

- .1 Inspection and testing shall be carried out by the Owner's Geotechnical Engineer.
- .2 Prior to placement of subsequent material the Contractor shall obtain approval from the Owner's Geotechnical Engineer.

### **3.4 Site Tolerances**

- .1 Finished sub-base surface to be within 120 mm 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 granular sub-base is to the satisfaction of the Engineer.

**END OF SECTION**

Aggregate Base Course

---

## **PART 1 – GENERAL**

### **1.1 Related Sections**

- .1 Excavating, Trenching and Backfilling: Section 31 23 33
- .2 Granular Subbase: Section 32 11 16

### **1.2 References**

- .1 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification, Highway Construction and Maintenance, Latest Edition.
- .2 American Society for Testing and Materials (ASTM)
  - .1 ASTM C 117-13, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 131-06, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .5 ASTM D 1557-12, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup>) (2,700kN-m/m<sup>3</sup>).
  - .6 ASTM D 1883-05, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
  - .7 ASTM D 4318-10, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
- .4 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.

### **1.3 Waste Management and Disposal**

- .1 Divert unused granular material from landfill to local facility as approved by the Engineer.

Aggregate Base Course

---

## **PART 2 – PRODUCTS**

### **2.1 Materials**

- .1 Granular sub-base material: in accordance with Section 31 23 33 – Excavating, Trenching and Backfilling, and as indicated on drawings.

## **PART 3 – EXECUTION**

### **3.1 Placing**

- .1 Place granular base after sub-base surface is to the satisfaction of the Engineer.
- .2 Construct granular base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow and ice.
- .5 Place material to full width in uniform layers. Lift thickness to be compatible with the compaction equipment used.
- .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 during spreading.

### **3.2 Compaction**

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to densities in accordance with contract documents.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .4 Apply water as necessary during compacting to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers to the satisfaction of the Engineer.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### **3.3 Quality Control Testing**

- .1 Inspection and testing shall be carried out by the Owner's Geotechnical Engineer.
- .2 Prior to placement of subsequent material the Contractor shall obtain approval from the Owner's Geotechnical Engineer.

### **3.4 Site Tolerances**

- .1 Finished sub-base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

Aggregate Base Course

---

**3.5 Protection**

- .1 Maintain finished sub-base in condition conforming to this section until succeeding material is applied or is satisfactory to the Engineer.

**END OF SECTION**

Asphalt Concrete Paving

---

## **PART 1 – GENERAL**

### **1.1 Section Includes**

- .1 Materials and installation for asphalt concrete paving for roadways.
- .2 Work includes fine grading, supply and placement of prime or tack coat and hot mix asphalt concrete.

### **1.2 Related Sections**

- .1 Cast in Place Concrete: Section 03 30 00
- .2 Excavating, Trenching and Backfilling: Section 31 23 33
- .3 Concrete Walks Curbs and Gutters: Section 32 16 15
- .4 Reinstatement: Section 32 98 00
- .5 Precast Manholes, Catch basins and Structures: Section 33 39 00

### **1.3 References**

- .1 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 1-74-2001 Alkyd Traffic Paint
- .2 Nova Scotia Department of Transportation and Infrastructure Renewal Standard Specification, Highway Construction and Maintenance, Latest Edition.
- .3 Transportation Association of Canada: Manual of Uniform Traffic Control Devices for Canada

### **1.4 Product Data**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit satisfactory asphalt concrete mix design and trial mix test results to the Engineer for approval at least 4 weeks prior to beginning Work.

### **1.5 Quality Control**

- .1 The Owner's Geotechnical Engineer will provide onsite materials testing, review and approve mix design (minimum 48 hours prior to placement), and provide input during placement of the materials.
- .2 While the Engineer will make results of any quality assurance test available to the Contractor, should adjustments be required, the Contractor shall provide the Owner's Geotechnical Engineer with any adjustments to produce uniform, acceptable hot-mix asphalt mixes in conformance with the Contract documents.

Asphalt Concrete Paving

---

## **PART 2 – PRODUCTS**

### **2.1 Asphalt Cement**

- .1 Performance Graded Asphalt Cement (PGAC) conforming to the requirements of Nova Scotia Department of Transportation and Infrastructure Renewal Highway Construction and Maintenance Standard Specifications, latest Edition.
- .2 The asphalt cement shall be homogeneous, free of water and any contamination and shall not foam when heated to the temperatures specified by the manufacturer for safe handling and use of the product. It shall be shipped, used and handled at all times in accordance with the manufacturer's specifications.
- .3 For each grade of asphaltic cement specified in the Contract, the Contractor shall supply to the Engineer, test results and two 1 litre samples for the products proposed for use to demonstrate compliance to the requirements at least 20 calendar days prior to the first use of the product.
- .4 The Contractor shall also concurrently provide the applicable mixing and compaction temperatures for each product, and documentation of construction, storage and handling requirements, including material safety data sheet, re-compaction temperature, mix discharge temperature and recommended extraction procedure.
- .5 The Contractor shall provide the Engineer with the asphalt cement supplier's certified test report for each lot of asphalt cement shipped to the work site.

### **2.2 Equipment**

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.
- .3 Vibratory rollers: .1 Minimum drum diameter: 750 mm. .2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.
- .4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
  - .1 Boxes with tight metal bottoms.
  - .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
  - .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
  - .4 Use only trucks which can be weighed in single operation on scales supplied.
  - .5 .Hand tools:
    - .1 Suitable hand tools.

### **2.3 Mix Design**

- .1 Mix design to be approved by the Engineer.
- .2 Mix design to Nova Scotia Department of Transportation and Infrastructure Renewal Highway Construction and Maintenance Standard Specifications, latest Edition and type as specified in the contract documents.

Asphalt Concrete Paving

---

## **2.4 Paint for Pavement Marking**

- .1 Paint for pavement marking to CGSB 1-GP-74M, colour as directed.

## **PART 3 – EXECUTION**

### **3.1 Preparation**

- .1 Granular Sub-base as per Section 32 11 16 - Granular Sub-Base.
- .2 Granular Base as per Section 32 11 23 - Aggregate Base Courses.
- .3 Prior to placing asphalt surface course:
  - .1 Adjust manhole covers and catchbasin frames to match asphalt surface, using manufactured grade rings.
  - .2 Adjust valve boxes to finished asphalt surface. Raise or lower top sections of valve boxes.
- .4 Prior to laying mix, clean surfaces of loose and foreign material.
- .5 Fine grade gravel surface to within 10mm of elevations and cross sections indicated immediately prior to placement of asphalt materials. Add or remove gravel as required. Compact to 100% Standard Proctor Density or as directed by the Engineer.
- .6 Prime Coat: When required by project documents, apply prime coat to Nova Scotia Transportation and Infrastructure Renewal Standard Specifications – Highway Construction and Maintenance, Division 4, Section 5.
- .7 Tack Coat: Apply tack coat on existing asphalt concrete to Nova Scotia Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance, Division 4, Section 1. Apply tack coat to contact surface of curbs, castings, and structures.

### **3.2 Placing**

- .1 Use workers skilled in placing asphalt concrete.
- .2 All material to be to the satisfaction of the Engineer prior to placing asphalt.
- .3 Place asphalt concrete to thicknesses, grades and lines as indicated on the Drawings and to the satisfaction of the Engineer.
- .4 Placing conditions:
  - .1 Place asphalt mixtures only when air temperature is above 5 degrees C.
  - .2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
  - .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
- .5 Place asphalt concrete in compacted lifts of thickness as indicated on the diagrams.
- .6 Minimum 135°C mix temperature required when spreading.
- .7 Maximum 160°C mix temperature permitted at anytime.

## Asphalt Concrete Paving

---

### 3.3 Compacting

- .1 Compact all paved areas to a density of not less than 95% of density obtained with Marshall specimens prepared in accordance with ASTM D 1559-89 from samples of mix being used. Roll until roller marks are eliminated.
- .2 General:
  - .1 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.
  - .2 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.
  - .3 Overlap successive passes of roller by minimum of 200 mm and vary pass lengths.
  - .4 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
  - .5 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
  - .6 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
  - .7 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side. Ensure that all points across width of pavement receive equal numbers of passes of compactors.
  - .8 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.
  - .9 Compact mix with hot tampers or other equipment to the satisfaction of the Engineer, in areas inaccessible to Roller.

### 3.4 Quality Control Testing

- .1 Inspection and testing shall be carried out by the Owner's Geotechnical Engineer.
- .2 Prior to placement of subsequent material the Contractor shall obtain approval from the Owner's Geotechnical Engineer.

### 3.5 Joints

- .1 General:
  - .1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.
  - .2 Paint contact surfaces of existing structures such as manholes, curbs, or gutters with bituminous material prior to placing adjacent pavement.
- .2 Transverse joints:
  - .1 Offset transverse joint in succeeding lifts by at least 600 mm.
  - .2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.

Asphalt Concrete Paving

---

- .3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.

**3.6 Finish Tolerances**

- .1 Finished asphalt surface to be within 6 mm of design elevation but not uniformly high or low.
- .2 Finished asphalt surface not to have irregularities exceeding 6 mm when checked with 3 m straight edge placed in any direction.

**3.7 Defective Work**

- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required. If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
- .2 Repair areas showing checking, rippling, or segregation.
- .3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

**3.8 Protection**

- .1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38°C. Do not permit stationary loads on pavement until 24 hours after placement.
- .2 Provide access to buildings as required. Arrange paving schedule so as not to interfere with normal use of premises.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Decorative stone boulders at locations 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 Submit photographs of stone proposed for installation as part of the *Work*.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Execute the work of this section only by a *Subcontractor*, with minimum 5 years experience, who has adequate equipment and skilled workers to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified.

## **PART 2 - PRODUCTS**

### **2.1 Performance/Design Requirements**

- .1 Design setting bed for superimposed loads.
- .2 Design for the effect of movement forces, deflection of the supporting structure, and handling stresses.

### **2.2 Materials**

- .1 Granular fill/base: DTIR Type 1 Gravel.
- .2 Stone boulders:
  - .1 Locally sourced, natural shaped (generally round), granite, diameter between 750 mm and 2000 mm.

## **PART 3 - EXECUTION**

### **3.1 Inspection**

- .1 Examine the substrates on which landscape boulders are to be laid and the conditions under which the work of this section will be performed, and notify *Consultant* in writing of any unsatisfactory conditions. Do not proceed with work of this section until unsatisfactory conditions have been corrected.

Landscape Stone Boulders

---

**3.2 Installation**

- .1 Place to locations and required orientation under the direction of the *Consultant*, on a bed of granular fill, compacted to at least 98% of its SPMDD.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Decorative landscape riverstone.

### **1.2 Administrative Requirements**

- .1 Sequencing and scheduling:
  - .1 Schedule distribution of riverstone to coincide with grading and other landscape operations.

### **1.3 Submittals**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Samples:
  - .1 Submit sample of proposed decorative landscape riverstone and filter cloth for review and acceptance by *Consultant*.

### **1.4 Delivery, Storage, and Handling**

- .1 Schedule deliveries in order to keep storage at *Place of the Work* to minimum without causing delays.
- .2 Deliver, unload and store where directed.
- .3 Deliver, store, and handle landscape materials to prevent damage and deterioration to material and to site.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Riverstone: Clean river washed granite rocks, average 150 mm (6") diameter.
- .2 Setting bed DTIR Type 1 Gravel.
- .3 Geotextile filter cloth:
  - .1 Non-woven geotextile of polypropylene or polyester fibers, or combination of both.
  - .2 Permeability:  $2.0 \times 10^{-1}$  K (cm/s) in accordance with CAN/CGSB 4.2 No. 11.1-94(R2013).
  - .3 Grab tensile: 690 N in accordance with CAN/CGSB 148.1, No. 7.3-92.
  - .4 Mullen burst: 1.4 Mpa in accordance with CAN/CGSB 4.2 No. 11.1-94(R2013).
  - .5 A.O.S.: 75 to 150 um
  - .6 Acceptable *Products*:
    - .1 Terrafix Geosynthetics Inc. 'Terrafix 270R'.
    - .2 Mirafi Inc. 'Mirafi 140N'.

Decorative Landscape Riverstone

---

- .3 Typar Geosynthetics 'Typar 3341'.
- .4 Substitutions: in accordance with Section 01 25 00.

### **PART 3 - EXECUTION**

#### **3.1 Examination**

- .1 Examine subgrade, finished surfaces, and installation conditions. Do not start work until unsatisfactory conditions are corrected.

#### **3.2 Preparation**

- .1 Remove loose material and debris from base surface before placing materials.
- .2 Obtain *Consultant's* acceptance of layout area prior to installation.

#### **3.3 Installation - Riverstone**

- .1 Install filter cloth over setting bed prior to installing stone. Lap minimum 150 mm on each side.
- .2 Place riverstone without damaging filter cloth where indicated on drawings. Application to fully cover surface area. Filter cloth is not to be visible.

#### **3.4 Adjusting and Cleaning**

- .1 Perform cleaning during installation of the Work and upon completion of the Work. Remove from site excess materials, debris, and equipment. Repair damage resulting from installing riverstone Work.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Related Sections**

- .1 Cast In Place Concrete: Section 03 30 00
- .2 Excavating, Trenching and Backfilling: Section 31 23 33
- .3 Asphalt Paving: Section 32 12 16
- .4 Concrete Forming and Accessories: Section 03 10 00
- .5 Reinstatement: Section 32 98 00.

### **1.2 References**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D 698-12, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .2 ASTM D1751-04 (R2008), Preformed Expansion Joint Filler for Concrete paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.2-98, Boiled Linseed Oil.
  - .2 CAN/CGSB-3.3-2007, Kerosene.
- .3 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .4 Nova Scotia Transportation and Infrastructure Renewal Standard Specifications – Highway Construction and Maintenance.

### **1.3 Waste Management and Disposal**

- .1 Separate and recycle waste materials
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely.

### **1.4 Quality Assurance**

- .1 Installer Qualifications: Installer must have a minimum of 5 years experience, adequate equipment, and skilled works to perform the work expeditiously, and is known to have been responsible for satisfactory installations similar to that specified.
- .2 Mock-up Panels: Provide a 1500mmx1500mm area selected by the Owner, complete with finish, contraction joint, and expansion joint for acceptance of remainder of work in this section. When accepted, quality of workmanship of balance of work shall meet or exceed quality of accepted mock-up.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Concrete mixes and materials: to Section 03 30 00 - Cast-in-Place Concrete, at 28 days, slump 80mm.
- .2 Joint filler and Curing Compound: to Section 03 30 00 - Cast-in-Place Concrete.
- .3 Granular base: to Section 31 23 33 - Excavating, Trenching and Backfilling.
- .4 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water soluble soap.
- .5 Fill material: to Section 31 23 33 - Excavating, Trenching and Backfilling.
- .6 Boiled linseed oil: to CAN/CGSB-1.2-98.
- .7 Kerosene: to CAN/CGSB-3.3-2007.

## **PART 3 - EXECUTION**

### **3.1 Grade Preparation**

- .1 Do grade preparation work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Construct embankments using excavated material free from organic matter or other objectionable materials. Dispose of surplus and unsuitable excavated material off site at approved location.
- .3 When constructing embankment, provide for minimum 0.5 m shoulders, where applicable, outside of neat lines of concrete.
- .4 Place fill in lifts compatible with compaction equipment and compact to at least 100% of maximum density to ASTM D 698.

### **3.2 Granular Base**

- .1 Subgrade to be to the satisfaction of the Engineer prior to placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Place fill in lifts compatible with compaction equipment and compact to at least 100% of maximum density to ASTM D 698.
- .4 Adjust castings to match finished surface prior to placing surface course of asphalt concrete, or Portland cement concrete.

### **3.3 Concrete**

- .1 Granular base and reinforcing steel to be to satisfaction of the Engineer prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Finish to be light sandblasted, providing a uniform finish to produce regular depressions not exceeding 2 mm deep.

Concrete Walks, Curbs, and Gutters

---

- .4 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work to the satisfaction of the Engineer. Hand finish surfaces when directed by the Engineer.

### **3.4 Quality Control Testing**

- .1 Inspection and testing shall be carried out by the Owner's Geotechnical Engineer.
- .2 Prior to placement of subsequent material the Contractor shall obtain approval from the Owner's Geotechnical Engineer.

### **3.5 Tolerances**

- .1 Finish surfaces to within 3 mm as measured with 3 m straightedge placed on surface.

### **3.6 Expansion and Contraction Joints**

- .1 Control joints to be minimum of one quarter of section thickness.
- .2 Geometry of all control joints to conform to locations shown on Landscape drawings.
- .3 Provide a control joint within 150mm of change in cross section of curbs, gutters and walks.
- .4 Finish perimeters of all slabs with an edger.
- .5 All control joint to be saw cut.
- .6 Install expansion joints to the satisfaction of the Engineer at intervals of 50m and at every cold joint.
- .7 Prior to installation of expansion and contraction joints in the plaza area, review planned saw cut placements with the Engineer and Owner's representative and only proceed upon receiving their approvals.

### **3.7 Isolation Joints**

- .1 Install isolation joint filler around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structures.
- .2 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete or as indicated.
- .3 Seal isolation joints with sealant to the satisfaction of the Engineer.

### **3.8 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 to the satisfaction of the Engineer.
- .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 in accordance with CSA A23.1. Apply evenly to form continuous film and in accordance with manufacturer's requirements.

Concrete Walks, Curbs, and Gutters

---

**3.9 Backfill**

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material to the satisfaction of the Engineer. Compact and shape to required contours as indicated or as to the satisfaction of the Engineer.

**3.10 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 sidewalks, 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 10°C.
- .4 Apply first coat at 135 mL/m<sup>2</sup>.
- .5 Apply second coat at 90 mL/m<sup>2</sup> when first coat has dried.

**3.11 Cleaning**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers to the satisfaction of the Engineer.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Related Sections**

- .1 Cast-In-Place Concrete: Section 03 30 00
- .2 Excavating, Trenching and Backfilling: Section 31 23 33
- .3 Concrete Walks, Curbs, and Gutters: Section 32 16 15
- .4 Concrete Forming and Falsework: Section 03 10 00
- .5 Reinstatement: Section 32 98 00

### **1.2 References**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D 698-12, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .2 ASTM D1751-04 (R2008), Preformed Expansion Joint Filler for Concrete paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.2-98, Boiled Linseed Oil.
  - .2 CAN/CGSB-3.3-2007, Kerosene.
- .3 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .4 American Society for Testing and Materials (ASTM)
  - .1 ASTM C1315 – Standard Specification for Liquid Membrane-forming Compounds Having Special Properties for curing and Sealing Concrete.
- .5 Nova Scotia Transportation and Infrastructure Renewal Standard Specifications – Highway Construction and Maintenance.

### **1.3 Action and Informational Submittals**

- .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit product data for the following materials and items:
  - .1 Admixtures
  - .2 Chemical Surface Retarders

Exposed Aggregate Concrete Paving

---

#### **1.4 Quality Assurance**

- .1 Manufacturer Qualifications: Company regularly engaged in the manufacturing of the products specified in this section, with at least 10 years' successful history manufacturing material specified herein.
- .2 Installer Qualifications: Installer who is approved by, or acceptable to manufacturer for application of surface retarders required for this Project, with at least five (5) years' experience in exposed aggregate finishing.
- .3 Mock-up Panels: Prepare one mock-up panel for each type and finish of exposed aggregate finish and aggregate combination at the project site to verify proper aggregate and mix design, demonstrate proficiency of the Installer, and determine the best procedures and degree(s) of aggregate exposure. Mock-up panels shall be a minimum of 1200mm x1200mm. Use methods and materials proposed for use on the final installation, including special aggregates, if required. The approved mock-up panel shall serve as a standard of appearance for the final work to be produced.
  - .1 Retain approved mock-ups during exposed aggregate finishing work to serve as reference for aesthetic intent and quality standard during final application.

#### **1.5 Delivery, Storage, and Handling**

- .1 Delivery and acceptance requirements:
  - .1 Deliver materials to the site in original factory packaging, labelled with manufacturer's name, address and product information.

#### **1.6 Waste Management and Disposal**

- .1 Separate and recycle waste materials.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely.

#### **1.7 Project Conditions**

- .1 Environmental Limitations: Comply with manufacturer's written instructions for ambient temperature and humidity, wind, precipitation, and other conditions affecting surface retarder performance.
- .2 Follow hot- and cold-weather concreting procedures specified in Section 03 30 00 – Cast-in-Place Concrete
- .3 Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.
- .4 Protect adjacent work from contamination due to mixing, handling, and application of surface retarders.

Exposed Aggregate Concrete Paving

---

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Concrete mixes and materials: to Section 03 30 00 - Cast-in-Place Concrete, at 28 days, slump 80mm.
- .2 Joint filler and Curing Compound: to Section 03 30 00 - Cast-in-Place Concrete.
- .3 Granular base: to Section 31 23 33 - Excavating, Trenching and Backfilling.
- .4 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water soluble soap.
- .5 Fill material: to Section 31 23 33 - Excavating, Trenching and Backfilling.
- .6 Boiled linseed oil: to CAN/CGSB-1.2-98.
- .7 Kerosene: to CAN/CGSB-3.3-2007.
- .8 Curing/Sealing compound: Clear, acrylic based, film-forming curing/sealing compound, conforming to ASTM C1315, Type 1, Class A, Seal Cure/25 or approved equivalent.

### **2.2 Chemical Surface Retarders**

- .1 Surface Retarder: Water based top-surface retarder designed to retard the setting (hydration) of the upper layer of cement paste, producing a 3/8" exposed-aggregate appearance of the concrete surface.
- .2 Acceptable Manufacturers:
  - .1 Dayton Superior Corporation or equivalent.
  - .2 Requests for similar product substitutions will be considered but are subject to approval by the Engineer/Architect.

### **2.3 Aggregate**

- .1 Aggregate: Well-graded, washed gravel and coarse sand as required to achieve intended aesthetic effect.

### **2.4 Water**

- .1 Water: Potable and at a temperature of not more than 21 deg. C.

## **PART 3- EXECUTION**

### **3.1 Grade Preparation**

- .1 Do grade preparation work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Place fill in lifts compatible with compaction equipment and compact to at least 100% of maximum density to ASTM D 698.

Exposed Aggregate Concrete Paving

---

### **3.2 Granular Base**

- .1 Subgrade to be to the satisfaction of the Engineer prior to placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated.
- .3 Place fill in lifts compatible with compaction equipment and compact to at least 100% of maximum density to ASTM D 698.
- .4 Adjust castings to match finished surface prior to placing surface course of asphalt concrete, or Portland cement concrete.

### **3.3 Concrete**

- .1 Granular base to be to satisfaction of the Engineer prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .3 Immediately after floating, give surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
- .4 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work to the satisfaction of the Engineer. Hand finish surfaces when directed by the Engineer.

### **3.4 Quality Control Testing**

- .1 Inspection and testing shall be carried out by the Owner's Geotechnical Engineer.
- .2 Prior to placement of subsequent material the Contractor shall obtain approval from the Owner's Geotechnical Engineer.

### **3.5 Tolerances**

- .1 Finish surfaces to within 3 mm as measured with 3 m straightedge placed on surface.

### **3.6 Finishing**

- .1 Finish surface per manufacturer's recommendations for exposed aggregate finish(es) indicated, and as required by Section 03 30 00 – Cast-in-Place Concrete.
- .2 Ensure smooth, flat surface, without low spots ("bird baths") which would allow applied materials to puddle.
- .3 Ensure no ridges or tool marks remain on slab surface.

### **3.7 Application**

- .1 Ensure that air, material, and surface temperature is at least 5 degrees C and rising prior to beginning application
- .2 Protect all surroundings from overspray of liquid materials, including, but not limited to, adjacent horizontal surfaces, windows, roofs, walkways, drives, and landscaping.
  - .1 Mixing: Mix surface retarder thoroughly prior to each use.
  - .2 Application:

Exposed Aggregate Concrete Paving

---

- .1 Begin application while slab is still wet, after the evaporation of all bleed water from the surface.
- .2 Apply surface retarder using low pressure sprayer to produce an even, continuous coating.
  - .1 Follow manufacturer's recommended coverage rate; do not under-apply.
  - .2 Comply with manufacturer's recommendations regarding rain protection until material is dry.
- .3 Removal:
  - .1 Begin removing retarded cement matrix after dwell time recommended by manufacturer, adjusted for field conditions. Unless field conditions substantially differ from those under which acceptable mock-up was produced, begin removal after same time period as was used for mock-up.
  - .2 Remove cement matrix with garden hose or 25 degree nozzle power washer.
    - .1 Stiff bristle broom or mechanical scrubber may be used as the primary or a supplementary means of removal.
    - .2 Take care not to mechanically remove more material than intended by using overly aggressive methods.

### **3.8 Curing and Sealing**

- .1 Curing: Apply curing compound to slab after water from retarder removal operations has dissipated. Coverage and application methods shall be in accordance with manufacturer's recommendations.
- .2 Sealing: Apply two (2) coats of curing/sealing compound once previous curing compound has dried. Coverage and application methods shall be in accordance with manufacturer's recommendations.

### **3.9 Jointing**

- .1 Control joints to be minimum of one quarter of section thickness.
- .2 The maximum joint spacing shall not exceed 25 times the slab thickness. Joint panels shall be square or nearly square.
- .3 Match control joints in abutting curb and walk to extent practical.
- .4 Saw cutting may be allowed if done as soon as concrete has set sufficiently to resist ravelling and before shrinkage cracks appear.
- .5 Install expansion joints to the satisfaction of the Engineer at intervals of 50m and at every cold joint.
- .6 Install isolation joint filler where concrete abuts permanent structures, curb, catchbasins, manholes, buildings, light standards, etc. to the satisfaction of the Engineer.

Exposed Aggregate Concrete Paving

---

**3.10 Cleaning**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers to the satisfaction of the Engineer.

**END OF SECTION**

Pavement Markings

---

## **PART 1 – GENERAL**

### **1.1 References**

- .1 CGSB 1-GP-12c-12, Standard Paint Colours.
- .2 Transportation Association of Canada, Manual of Uniform Traffic Control Devices of Canada, Part C.
- .3 Nova Scotia Transportation and Infrastructure Renewal Specification – Highway Construction and Maintenance.

## **PART 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 and white 513-301.

## **PART 3 – EXECUTION**

### **3.1 Equipment Requirements**

- .1 Paint applicator to be an approved pressure type mobile 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.

### **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 Temporary markings shall be applied as soon as possible
- .2 Allow asphalt concrete to cure a minimum of seven (7) days before application of permanent markings paint. Surface to be dry and clean prior to application. Apply paint at application rate indicated with spray gun to lines and at locations indicated. Dimensions and colour to Transportation Association of Canada Manual of Uniform Traffic Control Devices for Canada, Part C
- .3 Pavement markings to be laid out as indicated on the drawings unless otherwise specified by the Engineer.
- .4 Unless otherwise approved by the Engineer, 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 4 hours.
- .5 Apply traffic paint evenly at rate of 3m<sup>2</sup> /L.
- .6 Do not thin paint unless approved by Engineer.

### Pavement Markings

---

- .7 Symbols and letters to conform to dimensions indicated.
- .8 Paint lines to be of uniform colour and density with sharp edges.
- .9 Thoroughly clean distributor tank before refilling with paint of different colour.

#### **3.4 Tolerance**

- .1 Paint markings to be within plus or minus 12mm of dimensions indicated.
- .2 Protect pavement markings until dry.

**END OF SECTION**

## **PART 1– GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Thermoplastic pavement marking.

### **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 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*.

### **1.4 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 inclusion in the operation and maintenance manuals.

### **1.5 Quality Assurance**

- .1 Qualifications: *Provide* work of this section, executed by competent installers with minimum 3 years experience in application of *Products*, systems and assemblies specified, and with approval and training of *Product* manufacturers.
- .2 Mock-Up:
  - .1 Provide a mock-up as directed by the *Consultant*.
  - .2 Locate at the *Place of the Work* as part of final installation.

Thermoplastic Pavement Markings

---

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Thermoplastic pavement marking; to ASTM D7942-15.
  - .1 Colour: White.
- .2 Templates, re-heating equipment, and finishing tools: as recommended by thermoplastic panel manufacturer.

## **PART 3 - EXECUTION**

### **3.1 Preparation**

- .1 Substrate surfaces to be free from surface water, frost, ice, dust, oil, grease and other foreign materials.
- .2 Layout of the pattern for imprinting into the surface of the asphalt pavement shall be as indicated and in accordance to the methods prescribed by the thermoplastic pavement marking manufacturer.

### **3.2 Installation**

- .1 Apply the thermoplastic pavement markings in accordance with the manufacturer's instructions and recommendations.

### **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.

### **3.4 Protection**

- .1 The melted thermoplastic is to be protected until it cools and hardens. Do not permit any debris such as dust, water, pollen etc to come in contact with the melted thermoplastic.
- .2 The paved surface may be opened to traffic once the thermoplastic has cooled to 60° C (140°F).

**END OF SECTION**

Playground Surfacing

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Playground surfacing.

### **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: Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.
- .3 Samples: submit 200 x 300 mm (8" x 12") samples, on rigid backing, of each specified material and system, in each specified colour for *Consultant* approval.

### **1.4 Quality Assurance**

- .1 Qualifications: 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 of manufacturer.

### **1.5 Field Conditions**

- .1 Asphalt/concrete shall be allowed to cure a minimum of 30 days prior to application of polyurethane sport and recreational surfaces.
- .2 Do not apply system during rainfall, or when rainfall is imminent.
- .3 Minimum ambient temperature 10°C (50°F).

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Rubber safety surfacing:
  - .1 UV stable EPDM rubber granules ranging in size from 0.5 mm - 1.5 mm minimum to 1 mm – 4 mm maximum dimension with 100% polyurethane binder.
    - .1 Top layer of rubber granules must be composed of virgin rubber, cushion layer may contain recycled rubber.
    - .2 Acceptable *Products*:
      - .1 Rubaroc 'SafetyDeck'.
      - .2 Ure-Tech 'PlaySoft'.
    - .3 Substitutions: in accordance with Section 01 25 00.
  - .2 Primer: as recommended by surfacing manufacturer.
  - .3 Crack filler: as recommended by manufacturer.

Playground Surfacing

---

- .4 Surface leveller: as recommended by manufacturer.

**PART 3 - EXECUTION**

**3.1 Examination**

- .1 Asphalt/concrete shall be clean and dry, free of grease, oil, dust, dirt, and other foreign matter.

**3.2 Installation**

- .1 Install playground surfacing in accordance with manufacturer's written instructions and recommendations.
- .2 Primer:
- .1 Mix primer in accordance with manufacturer's instructions.
- .2 Allow primer to dry as recommended by manufacturer.

**3.3 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00.

**3.4 Protection**

- .1 No traffic or workers shall be allowed on completed surface for a period of 48 hours following completion of the work of this section, or longer as may be recommended by manufacturer.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Planting.

### **1.2 Administrative Requirements**

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19.
  - .1 Attendees shall include the following in addition to attendees lists in section 01 31 19: the supervisor/foreman appointed to oversee the work of this section; the supervisor/foreman responsible for soil preparation, mixes, and placement; and other persons required for coordination of work and quality control.
  - .2 Agenda to include:
    - .1 Review planting installation and sequence schedules and plant installations.
    - .2 Specification criteria and installation.
    - .3 Material sources procedures.
    - .4 Outstanding submittals and approvals.
    - .5 Other subjects necessary for coordination of planting work.
    - .6 Establish follow-up meeting(s) as necessary.
- .2 Landscaping schedule:
  - .1 Upon commencement of the *Work*, submit a detailed schedule of landscape activities including but not limited to the following:
    - .1 Date for pre-installation meeting.
    - .2 Dates for submission of landscape submittals;
    - .3 Dates for plant tagging and procurement.
    - .4 Dates for detailed landscape operations including soil deliveries, soil placement, and plant installations itemized by each exterior plant type.
  - .2 Submit as part of the construction schedule specified under Section 01 32 16.

### **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 manufactured or packaged *Product* proposed for use in the work of this section, including fertilizers, mulch, soil amendments, tree staking materials and plant treatment material as applicable.
- .3 Plant list and source identification:
  - .1 Submit a complete list of all plant material proposed for use in the work of this section, complete with nursery source identification for each plant.

Planting

---

- .1 Include in plant list the botanical and common names, size, quantity, form, root ball, limb height (if applicable), other requested data, and source locations for all plant materials.
- .2 Include names, addresses, and phone numbers of each nursery source associated with each plant item.
- .3 Plant lists shall clearly identify deviations from the specified plants and any approved substitutions. Submit substitution requests, if any, in accordance with Section 01 26 00. Where deviations or other changes occur in plant list, identify both the original specified plant item and the new plant item.
- .4 Plants listed with submittal shall be available at the nursery for inspection and selection as specified elsewhere in this specification section. Evaluate and verify at proposed nursery source that plant material conforms to the requirements of the *Contract Documents* prior to scheduling *Consultant's* inspection and selection/tagging trip.
- .2 Maintain and re-submit updated plant list and source identification as deviations or other changes occur until *Substantial Performance of the Work*.
- .3 Submit photographs taken of all trees at plant nurseries in accordance with Quality Assurance requirements specified below in this section. Submit to *Consultant*.
- .4 Samples:
  - .1 Submit 225 gram (0.5 lb) samples of mulch in labelled plastic bags.
  - .2 Submit 900 gram (2 lb) samples of imported topsoil in labelled plastic bags.
  - .3 Submit soil testing prior to commencing *Work* for *Consultant's* review and acceptance.
  - .4 Submit horticultural soils analysis.
  - .5 Prepare random samples of imported topsoil requesting analysis for:
    - .1 NPK and minor values,
    - .2 Salinity in millimhos/cm at 25°C.
    - .3 Organic matter/organic material content as a percentage of dry weight.
    - .4 Acidity (pH) and recommendations for treatment of soils for seeding and sodding, and additives required to support vigorous growth.
    - .5 Test imported subsoil for substances detrimental to plants.
  - .6 Soil analysis tests shall indicate soils are well drained.
  - .7 Soil testing shall be carried out by an approved, independent inspection and testing agency
  - .8 Arrange for, and be responsible for, all costs related to soil testing.
  - .9 As part of this work, adjust fertilizing requirements adding other additives to conform to soil testing report recommendations.

#### 1.4 Closeout Submittals

- .1 As-built data:

Planting

---

- .1 Submit updated plant list and source identification as a part of as-built and closeout documents in accordance with Section 01 77 00..
- .2 Maintenance data:
  - .1 Submit maintenance instructions for incorporation into the operation and maintenance manuals in accordance with Section 01 77 00.
  - .2 Include Recommended procedures to be followed by *Owner* for maintenance of exterior plants during a calendar year.

## 1.5 Quality Assurance

- .1 Qualifications:
  - .1 Nursery / plant supplier qualification:
    - .1 Plant Nursery(ies) shall have a nursery facility as an integral part of operation where majority of plants can be grown and reviewed, shall be reputable, and shall have been in continual operation with a minimum of 7 years experience as a plant grower. Nursery shall be capable of the following as a minimum:
      - .1 Supplying plant material conforming to the quality standards, visual characteristics, sizes, species cultivars, and quantities indicated by *Contract Documents*.
      - .2 Conformance to cultural practices and maintenance procedures suitable for healthy plant material.
  - .2 *Subcontractor* qualifications:
    - .1 Execute the work of this section only by a *Subcontractor*, with minimum 5 years experience, who has adequate equipment and skilled workers to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified.
  - .3 *Subcontractor* personnel:
    - .1 Installers shall be Certified Landscape Technicians.
    - .2 Supervisor(s) shall be maintained full-time at the *Place of the Work* when installation or maintenance is in progress.
- .2 Source quality control:
  - .1 Plant selection and review:
    - .1 Make all pre-selection arrangements at the source(s) of supply to ensure a ready supply of materials, equipment and man power required for an efficient selection procedure.
      - .1 If *Consultant* arrives at nursery at appointed time and determines there is no ready supply, then *Contractor* shall reimburse the *Consultant* for time and travel costs expended in these 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.
    - .2 Locate plant material and be present for inspection at the source and on site.

## Planting

---

- .3 Plants will be reviewed at the source and selection made by the *Consultant* for conformity to specification requirements. If approved for conformity, such approval shall not affect the right of rejection during delivery and installation.
- .4 Photograph trees at plant nurseries. Tag trees with plastic tree tags on north side of growing condition. Submit photographs as described above in this section.
- .5 Review upon delivery at the *Place of the Work*: in accordance with Field Quality Control paragraphs below in this section.
- .3 Perform work of this section on public property in accordance with design and material requirements of applicable local authorities which are imposed in addition to requirements specified in this section.

### 1.6 Delivery, Storage, and Handling

- .1 Co-ordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.
- .2 Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire which would damage bark, break branches or destroy natural shape of plant. Give full support to root ball of large trees during lifting.
- .3 Cover plant foliage with tarpaulin, and protect bare roots by means of dampened straw, peatmoss, saw dust or other acceptable material to prevent loss of moisture during transit and storage.
- .4 Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 10 mm (3/8") diameter with wound dressing.
- .5 Keep roots moist and protected from sun and wind. Heel-in trees and shrubs, which cannot be planted immediately, in shaded areas and water well.
- .6 Do not remove labels from plants unless directed to do so by *Consultant*.
- .7 Plants not in conformance with the *Contract Documents* will be rejected.
- .8 Replace rejected *Products* as required to meet specifications.
- .9 Deliver peat moss in commercial containers marked with weight, analysis and manufacturer's name.

### 1.7 Extended Warranty

- .1 Warrant work of this section in accordance with Section 01 78 36 for a period of 2 years and as follows:
  - .1 Extended warranty period commencement: from date of acceptance of planting by the *Consultant*.
  - .2 The *Contractor* hereby warrants that plant material as itemized on plant list will remain free of defects for 2 full growth seasons.
  - .3 End-of-warranty inspection will be conducted.

## Planting

---

- .4 *Consultant* reserves the right to extend warranty responsibilities for an additional 1 year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.
- .5 Warrant the following exterior plants, for the warranty period indicated against defects including death or those, in the opinion of the *Consultant*, in unhealthy or unsightly condition, or that have lost their natural shape due to dead branches, excessive pruning, excessive defoliation, or inadequate or improper maintenance, except for defects resulting from lack of adequate maintenance, neglect, or abuse by *Owner*, or incidents that are beyond warrantor's control:
- .6 Replacements:
  - .1 Remove dead exterior plants immediately. Replace immediately unless required to plant in the succeeding planting season.
  - .2 Replace unacceptable plants with new material in accordance with requirements of original *Contract Documents*.
  - .3 Extend warranty on replacement plant material for a period equal to the original warranty period.
  - .4 Continue such replacement and warranty until plant material is acceptable.
  - .5 Tag or mark, in a permanently visible manner replacement plant material and notify the *Consultant* in writing of the date the replacements were made.
  - .6 Cost of replacement is included in the warranty.

## PART 2 - PRODUCTS

### 2.1 Plant Material

- .1 Plants shall be nursery-grown plants of exceptionally good quality pertaining to the species and of type, form and character of the plants specified. Use plants of No. 1 grade in accordance with the Canadian Standards for Nursery Stock, most recent edition, of Canadian Nursery Landscape Association.
  - .1 *Consultant* reserves the right to inspect plants and to select plants at place of growth.
  - .2 Refer to drawings for plant list and planting layouts. Plant list is for guide only. Quantities, sizes, and types of plant material shall be verified by *Contractor's* review of planting plans and layouts. Where discrepancies are identified and additionally verified with the *Consultant*, the planting plans shall take precedence.
  - .3 Groundcover or perennials shall not be planted over rootballs.
  - .4 Botanical names shall take precedence over common names.
  - .5 Plant Measurement Criteria:
    - .1 Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock".

Planting

---

- .2 Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take calliper measurements 6 inches above ground for trees up to 100 mm (4") calliper size, and 305 mm (12") above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.
- .2 Plants shall meet the following minimum requirements in addition to other specific requirements specified in this section:
  - .1 Normal, well developed branches.
  - .2 Vigorous fibrous root systems.
  - .3 Healthy, vigorous, free from defects such as decay, disfiguring heads, trunks and roots, sun scald, injuries, frost cracks, abrasions of the bark, plant diseases, insect pest eggs, borers and other forms of infestations.
  - .4 Plants with old injuries shall be completely calloused over, but are subject to acceptance by the *Consultant*.
  - .5 Straight trunks with leader intact growing from unmutilated crowns and roots.
  - .6 Grown under climatic and soil conditions similar to those at the *Place of the Work* for at least two years prior to use on this *Project*.
  - .7 Notify the *Consultant* if plant material is to be obtained from areas with milder climatic conditions from those of the *Place of the Work*. Relocate these plants to the *Place of the Work* prior to the breaking of buds in their original location and heel-in in a protected area until conditions are suitable for planting. Arrange for the *Consultant* to examine these plants prior to shipment to *Place of the Work*.
  - .8 Obtain approval from *Consultant* in writing for use of material being held in cold storage.
  - .9 Nursery stock shall have been transplanted or root pruned prior to planting at the *Place of the Work*.
  - .10 Do not prune plants prior to planting, except plants over 3048 mm (10 ft) in height which shall be pruned after being placed at location of planting for the *Consultant's* review.
  - .11 Plants shall be freshly dug at time of delivery.
  - .12 Cold storage: Written approval required for plant material which has been held in cold storage.
  - .13 Plants with the following faults are not acceptable:
    - .1 Root bound in containers, lacking in compaction, weak or thin, stalky in overall configuration, not consistent with natural shape and growth character, improper proportions, damaged leaves and stems, infested and diseased above or below soil level, injured or deformed by too close planting in nursery or green house, grown under excessive use of forced growth methods, cut back from grades larger than specified, injured during shipping and installation, and broken root balls.
    - .2 Plant material that has come out of dormant stage and is too far advanced will not be accepted unless prior approval obtained.

Planting

---

- .3 *Consultant's* decisions as to which plants are not acceptable is final.
- .3 Specimen plants: Exceptionally good quality pertaining to the species and of type, form, character or habit of the plants specified. *Consultant* reserves the right to select these plants at place of growth. Quality standards set by trade organizations may not necessarily apply.
- .4 Clumps:
- .1 Minimum of three stems except where specified otherwise on drawings, deriving out of one root system, well branched from the bottom upwards. Made clumps will not be accepted. Exceptions may be made on clumps in terms of stem caliper and height on secondary stems depending on overall appearance of tree. Height of secondary stems shall be in proportion to their trunk caliper. Example of typical trunk sizes for clumps:
- .1 Specified main trunk size: 90 mm (3-55/64") caliper
- .2 Trunk size for second stem: 80 mm (3-9/64") caliper
- .3 Trunk size for third stem: 70 mm (2-3/4") caliper
- .2 Root spreads or balls: 20% larger than single trunk trees.
- .5 Container grown plants:
- .1 Plants shall be grown in containers such as pots, cans, tubs, or boxes with sufficient roots to hold earth together after removal of containers, but without being root-bound.
- .2 Do not remove containers until plants are ready for planting. Plants shall have been growing in containers for at least three months and a maximum of one year prior to delivery.
- .3 Container stock shall have been fertilized with slow releasing fertilizer.
- .6 Balled and burlapped, and string balled plants:
- .1 Refer to lists of plants on the drawings for the following designations:
- .1 BR: Bare rooted.
- .1 Bare rooted plants shall be dug only when fully dormant with the root system substantially intact and earth carefully removed from the roots. Puddle roots in the nursery immediately after digging by immersing in a thick mixture of clay and water or any other method to prevent root desiccation. Stored plants shall be covered up until planted. Prune roots by knife before planting as directed by *Consultant*.
- .2 B&B: Balled and burlapped.
- .1 Plant material shall have a compact natural ball (no artificial or cracked balls will be accepted) of earth so firmly wrapped in burlap and tightly bound with rope that, upon delivery, the soil in the ball is still firm and compact around the small feeding roots.
- .2 Each ball shall be of sufficient size to encompass the fibrous feeding roots necessary to insure successful recovery and development of the plant.

## Planting

---

- .3 Conform to the recommendations of Article 5 of CNTA Canadian Standards for Nursery Stock for minimum earth ball depths.
- .4 Coniferous and broadleaf evergreens over 500 mm (20") tall shall be dug with soil ball.
- .5 Deciduous trees in excess of 3 m (10') height shall have been dug with large firm ball.
- .6 Root balls shall include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil.
- .7 Secure root balls with burlap, heavy twine and rope. For large trees wrap ball in double layer of burlap and drum lace with minimum 10 mm (3/8") diameter rope.
- .8 Protect root balls against sudden changes in temperature and exposure to heavy rainfall.
- .9 Plastic wrapping material for balling plants will not be permitted.
- .3 SB: String balled.
- .4 WB: Wire basket.
- .5 P: Potted or container plants.
- .6 MTS: Mechanical tree spade.
- .7 Measurement:
  - .1 Measure tree trunks at 150 mm (6") above ground level or root collar for trees up to 100 mm (4") caliper and at 300 mm (12") above ground level or root collar for trees larger than 100 mm (4") caliper. On fruit trees measure caliper 50 mm (2") above the bud union.
  - .2 Measure plants when branches are in their normal position. Height and spread dimensions specified refer to main body of plant and not from branch to branch tip or root to root tip.
  - .3 Measure height of plants from root collar or ground line.
- .8 Substitutions for plants specified in the *Contract Documents* will not be accepted except as follows:
  - .1 Bidders are required to check availability of species at time of bidding. If specified species are not available, notify the *Consultant* immediately. If the *Consultant* confirms that the lack of supply is common to most Bidders, appropriate Addenda will be issued naming a substitute species.
  - .2 Plants larger than sizes specified may be used subject to review by the *Consultant* and providing there is no additional cost. Increase ball of earth for root system in proportion to size of plant.
  - .3 Trees smaller than sizes specified will not be considered as substitutions.

## 2.2 Planting Accessory Materials

- .1 Fertilizer: Complete synthetic slow release fertilizer with maximum 10% water soluble nitrogen.

Planting

---

- .2 Loam or compost:
  - .1 Fertile, friable, horticultural soil consisting of clay, silt and sand particles and containing not less than 10% organic matter. Ratio of mass (solids) to voids shall be 50 to 50. Compositions shall be uniform throughout, free of stones, seeds, lumps, roots and other extraneous matter, foreign chemicals, and infectious toxic substances detrimental to plants. Hydrogen ion value of 6.5.
- .3 Manure:
  - .1 Well rotted, unleached, cattle manure containing not more than 15% bedding materials such as straw or similar matter, free of sawdust, shavings, injurious substances and chemicals used to hasten decomposition and not less than one or more than 2 years old. Maximum 60% moisture content by weight.
- .4 Sand:
  - .1 Clean mortar sand to CAN/CSA A179-04.
- .5 Bonemeal:
  - .1 Finely ground commercial raw bonemeal with minimum 4% nitrogen and minimum 20% phosphoric acid.
- .6 Mulch:
  - .1 Broken stone mulch. Colour to be black, 5-15 mm size.
- .7 Water for watering plants: Potable, free of impurities and contaminants that would adversely affect plant growth.
- .8 Root ball burlap: 150 g Hessian burlap.
- .9 Cut or wound dressing: Non-toxic asphaltum dressing, winter or summer grade.
- .10 Tree anchoring system; permanent, below grade system:
  - .1 Acceptable *Products*:
    - .1 Foresight Products 'Duckbill Earth Anchor Model 40 -RBK'.
    - .2 GreenMax 'Root Ball Anchoring'.
    - .3 Platipus Earth Anchoring Systems 'Tree Anchoring System'.
- .11 Geotextile:
  - .1 Non-woven geotextile of polypropylene or polyester fibres, or combination of both.
  - .2 Weight: Approximately 395 g/m<sup>2</sup> to ASTM D5261.
  - .3 Grab tensile strength: Approximately 1330 N (299 Pound Force) to ASTM D4632/D4632M-15a.
  - .4 Water flow rate: Approximately 3055 l/min/m<sup>2</sup> to ASTM D4491/D4491M-16.
  - .5 Puncture: Approximately 3780 N (849 Pound Force) to ASTM D4833/D4833M-08(2013)e1.
  - .6 Apparent Opening Size (AOS): Approximately 0.150 mm (0.008") to ASTM D4751-16.
  - .7 UV stability: 70% at 500 hours to ASTM D4355-07.

Planting

---

.8 Basis of design:

.1 Spun bonded 'Terrafix 800R'

- .12 Drainage line (weepers) and capped riser pipes: 100 mm (4") minimum diameter, flexible high density polyethylene (HDPE), BNQ 3624-115-2007, fully perforated complete with one-piece geotextile filter sock, non-perforated at pass through to riser pipes, weeper manufacturer's standard connector fittings and caps.

.1 Basis of design:

- .1 Armtex 'Big O Drain Tubing' perforated and complete with geotextile knitted polyester filter sock.

.13 Clear stone:

- .1 Crushed (not round), 19 mm (3/4") clear washed granite, with no fines. Limestone materials are not acceptable.

.14 Aggregate fill:

- .1 Coloured aggregate: Clean crushed slate chips, 25.4 mm (1") to 38 mm (1-1/2") in size, black colour.

## 2.3 Imported Topsoil Mix

- .1 Topsoil shall be imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 100 mm (4") deep; do not obtain from agricultural land, bogs or marshes. Material shall be free of stones 38 mm (1-1/2") or larger in any dimension and other extraneous materials harmful to plant growth. Comply with the following additional requirements:

- .1 pH: Between 6.0 and 7.0 as determined by ASTM D-4972.

- .2 Organic content: Between 3% and 6% as determined by ASTM F1647-99.

- .3 Particle Size as determined by ASTM C-136:

- .1 37.5 mm (1 1/2") sieve size: 100% minimum passing.

- .2 19 mm (3/4") sieve size: 95% minimum passing

- .3 4.75 mm (No. 4) sieve size: 75% minimum passing

- .4 2 mm (No. 10) sieve size: 60% minimum passing

- .4 Textural Class as determined by combined hydrometer and wet sieving in compliance with:

- .1 Textural Class% Total Weight

- .2 Sand textural class (0.05—2.0 mm dia. range): 45-75% total weight.

- .3 Silt textural class (0.002—0.05 mm dia. range): 15-25% total weight

- .4 Clay textural class (Less than 0.002 mm dia. range): 5-10% total weight

- .5 Internal Rate of Percolation: Between 1" and 3" per hour.

- .6 Salinity: less than 4.0 mmhos/cm (dS/m) as determined by NRP-493 method.

Planting

---

## 2.4 Planting Soil Mix Schedule

- .1 Planting Soil to be used as planting medium for planting beds. *Provide* soil amendments in not less than the following quantities:
  - .1 Ratio of loose compost to topsoil by volume: 1:7.
  - .2 Weight of lime per cu. Ft. of backfill: as required per test and analysis.
  - .3 Weight of bonemeal per cu. Ft. ½ lb. Per cu. ft.
  - .4 Weight of superphosphate per cu. Ft. As per test and analysis.
  - .5 Weight of potash per cu. Ft. As required per test and analysis.
  - .6 Weight of commercial fertilizer per 1000 sq. ft.: As required per test and analysis.

## PART 3 - EXECUTION

### 3.1 Placement of Planting Soil Mix at Planting Areas

- .1 Spread planting soil to depths indicated on the plans but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- .2 Compaction levels with material dry density as determined by ASTM D-2922 shall be as follows:
  - .1 Under planting areas: 85% maximum, Modified Proctor, but uniform in any defined area. At any site areas designated for lawns and planting, care shall be taken not to over compact soils.
- .3 Compaction shall be continuous over the entire area as indicated for each density value and in uniform layers no more than thickness specified (after compaction). Equipment shall make sufficient passes to obtain uniformly the desired density. Each layer shall be compacted before the overlaying lift is placed. Compaction layer thickness shall be as follows:
  - .1 At on-site areas by heavy equipment: 12" maximum thickness.
  - .2 At conditions compacted by hand-operated equipment: 6" thickness.

### 3.2 Tree And Shrub Planting

- .1 Do final planting of trees and shrubs in the least possible time after removal from original planted location. Conduct planting during suitable weather conditions.
- .2 Stake out planting locations or areas for the *Consultant's* review and make adjustments as necessary or directed. If underground obstructions are encountered, change locations as directed.
- .3 Dig pits to the following dimensions:
  - .1 Up to 400 mm (16") ball: 800 mm (31-1/2") diameter x 450 mm (18") deep (shrubs only)
  - .2 Up to 500 mm (19-5/8") ball: 1000 mm (39-3/8") diameter x 610 mm (24") deep.
  - .3 Up to 1000 mm (39-3/8") ball: 1600 mm (63") diameter x 610 mm (24") deep.
  - .4 Up to 1525 mm (60"): 2300 mm (90-1/2") diameter x 900 mm (35-7/16") deep.

### Planting

---

- .5 Up to 2000 mm (78-3/4") ball: 3000 mm (118"-1/8") diameter x 900 mm (35-7/16") deep.
- .4 Remove excavated material from the Place of the Work.
- .5 Scarify the bottom of plant pits to depth indicated.
- .6 Fill bottom portion of tree pits with topsoil in 150 mm (6") layers and compact to bring levels to correct grade to receive tree ball and topsoil mixture. Till first layer into scarified pit bottom.
- .1 Compaction shall be as specified above in this section.
- .7 Set trees in centre of pits, plumb and straight and at same depth after settlement as they originally grew. In consultation with the *Consultant* place trees to give the best appearance and relationship to adjacent structures. Set trees in partially-filled pits or prepared topsoil mixtures.
- .8 Remove burlap, from top of balls but do not remove burlap from under balls.
- .9 Place topsoil mixtures in layers around earth balls and root systems and tamp carefully to avoid damage and to eliminate air pockets. When hole is half filled, soak with water to settle the soil more firmly. While saturated soil is still in "soupy" condition, check and adjust trees to their final position and securely guy in position.
- .10 Tree anchoring:
  - .1 Anchor trees in accordance with planting details.
  - .2 Install tree anchor systems as specified and indicated in accordance with manufacturer's written instructions.
- .11 After soil around tree has drained completely, fill hole with topsoil leaving a shallow saucer directly over the ball of earth and slightly smaller than the pit to facilitate watering.
- .12 Report abnormal water conditions or indications of water seepage at planting areas to *Consultant* before backfilling.
- .13 After ground settles, fill with additional soil and level off as shown on drawings.
- .14 If trees are planted in areas where de-icing salts can accumulate during winter, leach salts out from soils by repeated flooding of tree pits or tree root areas. Where ground topography does not allow flooding, install temporary soil saucers around trees up to drip lines. After flooding remove temporary saucers.

### 3.3 Planting Beds Including Perennials & Grasses

- .1 Plant shrubs in least possible time between digging and final planting.
- .2 Plant during suitable weather conditions acceptable to *Consultant*.
- .3 Stake out planting areas, for *Consultant's* review, and adjust locations as directed. Allow for underground obstructions.
- .4 Scarify the bottom of plant pits to depth indicated.
- .5 Set shrubs in partially filled pits of prepared topsoil mixture. Set shrubs in centre of pits, plumb and straight and at same depth after settlement as they originally grew. Position shrubs to give best appearance and relationship to adjacent plants and structures.
- .6 Remove burlap and all foreign material from plant.

## Planting

---

- .7 Remove burlap and bindings from top of balls.
- .8 Place topsoil mixtures in layers around earth balls and root systems and tamp carefully to avoid damage and to eliminate air pockets. When hole is half filled soak with water to settle the soil. While saturated soil is in "soupy" condition adjust plants to their final position.
- .9 When soil around shrubs has drained completely fill balance of hole with topsoil mixture leaving a shallow saucer directly over the ball of earth slightly smaller than the pit to facilitate watering.
- .10 After ground settles, fill with additional soil mix, level and place.
- .11 Report abnormal water conditions or indications of water seepage at planting areas to *Consultant* before backfilling.

### 3.4 Mulching Procedures

- .1 Fill top portion of tree pits, shrubs and planting beds with mulch to depths indicated on drawings. Till first layer into scarified subsoil.

### 3.5 Pruning Of Trees and Shrubs

- .1 Prune at time of planting only to remove broken or dead branches.
- .2 Broken or dead branches shall be pruned back to the parent stem or lateral pruning point.
- .3 Cut branches with sharp pruning instruments; do not break or chop.
- .4 Remove pruned tree branches and dispose of off-site.
- .5 Prevent disease infection by sterilization of pruning equipment.

### 3.6 Use of Chemicals

- .1 Apply, take care, store and provide protection necessary and as directed by the manufacturer when using chemicals (insecticides, fungicides and herbicides) and multi-purpose chemicals for weed, fungi and insect control so that harmful and destructive side effects resulting from contact with humans, animals and plants are avoided. Make good any damage whatsoever resulting from the use of chemicals without cost to *Owner*.
- .2 Comply with pesticide control regulations of locality in which Work is to be carried out.
- .3 Retreat unaffected areas as necessary until specified control is achieved.
- .4 If application is only partially required, as determined by the *Consultant*, submit a credit for the *Work* not completed.
- .5 Indicate by use of signs areas which have been treated with herbicides.

### 3.7 Field Quality Control

- .1 Obtain approval of plant material at source.
  - .1 Review upon delivery at the *Place of the Work*:
    - .1 The *Consultant* will review all plant material upon delivery to the *Place of the Work* prior to installation. Include allowances in the landscaping schedule, in consultation with the *Consultant*, for such review and layout adjustment prior to installations.

## Planting

---

- .1 Rejected plants shall be removed immediately from the *Place of the Work*.
- .2 Acceptance of plant material at its source does not prevent rejection on site prior to or after planting operations.
- .3 Notify *Consultant* of source of material at least 5 *Working Days* in advance of shipment. No work under this section is to proceed without approval.
- .4 Imported plant material must be accompanied with necessary permits and import licenses.

### 3.8 Protection

- .1 *Provide* protection to ensure that plants survive through the Winter season.
- .2 *Provide* temporary snow fencing until plants are 75 mm (3") tall.

### 3.9 Maintenance

- .1 Maintenance of planting soil grading:
  - .1 Protection of newly graded areas:
    - .1 Protect newly graded areas from vehicular traffic and erosion. No mechanical equipment shall be operated over any planting soil mixes either during or after placement.
    - .2 Keep all graded Planting Soil areas free of trash and debris.
    - .3 Repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.
  - .2 Reconditioning compacted graded areas:
    - .1 Where completed compacted areas are disturbed by subsequent construction operations or adverse weather or are over compacted, scarify the surface, reshape and compact to the required density prior to further construction.
- .2 Water once a week for first 4 weeks and then sufficiently thereafter to maintain optimum growing conditions. Ensure adequate moisture in root zone at freeze-up.
- .3 Keep soil, within confines of planting saucer around trees and planting beds, shallowly cultivated and free from weeds.
- .4 Spray plants to combat pests and diseases. Do not use DDT or sprays prohibited by Agriculture Canada.
- .5 *Provide* adequate protection against winter damage including damage caused by rodents.
- .6 Maintain plant material from date of planting up to end of warranty period.

**END OF SECTION**

Grass Seeding (Hydraulic)

---

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Grass seeding (hydraulic).

### **1.2 Administrative Requirements**

- .1 Sequencing and scheduling:
  - .1 Schedule placing of topsoil, finish grading and seeding to suit conditions at the *Place of the Work* and requirements of this section.

### **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.

### **1.4 Delivery, Storage, and Handling**

- .1 Deliver and store grass seeds in original containers showing: blend of grass seed mixture, percentage of pure seed, year of production, net mass, date when tagged and location, percentage germination, and name and address of distributor, all in accordance with Government of Canada Seeds Regulations.
- .2 Deliver soil media in original packaging in accordance with manufacturer's recommendations.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Seed: Canada No. 1 grade, fresh, clean and new crop seed adaptable to local conditions at the *Place of Work*, having minimum germination of 80% and minimum purity of 97% and in accordance with Government of Canada Seeds Act and Seeds Regulations.
  - .1 Seed mixture: Quality Seeds 'QS Meadow Mixture'.
- .2 Fertilizer: Complete analysis 5-10-5 slow release type with maximum 35% water soluble nitrogen.
- .3 Topsoil: in accordance with Section 31 22 19.
- .4 Soil amendments:
  - .1 Basis of design:
    - .1 Profile 'ProGanics Biotic Soil Media (BSM)'.
  - .2 Soil media with 89% thermally refined organic fibres, 11% blend of bio amendments, and 12% moisture content.
- .5 Herbicide: Brand specifically made for newly seeded lawns.

Grass Seeding (Hydraulic)

---

## **PART 3 - EXECUTION**

### **3.1 Preparation**

- .1 Fine grade subgrade to eliminate uneven areas, low spots and ensure positive drainage. Remove debris, roots, branches, stones in excess of 50 mm (2") diameter and deleterious materials. Obtain review of subgrade by *Consultant* before placing topsoil.

### **3.2 Spreading of Topsoil**

- .1 Spreading of topsoil shall be in accordance with Section 31 22 19.

### **3.3 Application of Fertilizer**

- .1 Apply fertilizer at least 6 days prior to seeding.
- .2 Spread fertilizer with mechanical spreaders over area(s) to be seeded at rate recommended by manufacturer.
- .3 Mix fertilizer thoroughly into upper 50 mm (2") of topsoil.

### **3.4 Finish Grading**

- .1 Finish grading shall be in accordance with Section 32 92 19.

### **3.5 Seeding**

- .1 Preparation of slurry
  - .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to *Consultant*. Supply equipment required for this work.
  - .2 Charge required water into seeder. Add material into hydraulic seeder under agitation.
  - .3 After materials are in seeder and well mixed and mix thoroughly to complete slurry.
- .2 Slurry application:
  - .1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.
  - .2 Hydraulic seeding equipment:
    - .1 Slurry tank.
    - .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.
    - .3 Capable of seeding by hand operated hoses and appropriate nozzles.
    - .4 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".
  - .3 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
  - .4 Using correct nozzle for application.
  - .5 Using hoses for surfaces difficult to reach and to control application.

Grass Seeding (Hydraulic)

---

- .6 Blend application 300 mm into adjacent grass areas or sodded areas to form uniform surfaces.
- .7 Re-apply where application is not uniform.
- .8 Remove slurry from items and areas not designated to be sprayed.

**3.6 Maintenance**

- .1 Water seeded areas as required to maintain optimum soil moisture level for continued growth of grass.
- .2 Cut grass when it reaches height of 75 mm (3") and cut to 50 mm (2"). Repeat as necessary during maintenance period. Remove clippings. Fertilize new lawn after first cutting. Apply half recommended rate on package and 4 weeks later apply second application at full rate.
- .3 Remove weeds by hand. Apply herbicide to control weeds only with written permission of *Consultant*. Protect other plants from herbicide. Apply herbicide in accordance with manufacturer's printed directions.
- .4 Pick-up debris, papers, construction material from seeded area(s) and remove from the *Place of the Work*.
- .5 Trim seeded area(s) around planting beds, building walls, trees and other appurtenances to neat lines.
- .6 Maintenance period for seeded area(s) shall be from date of seeding until 2 years following date of *Substantial Performance of the Work*. Make good grass not properly established or washed out, by preparing soil and reseeding at no extra cost to *Owner*. Established seeded area(s) shall have uniform, close, dense grass with no more than 2 broadleaf weeds or 10 other weeds per 40 m<sup>2</sup> (400 ft<sup>2</sup>).

**END OF SECTION**

Reinstatement

---

## **PART 1 – GENERAL**

### **1.1 Work Included**

- .1 This section specifies requirements for reinstatement of surfaces, property, and structures damaged or disturbed by operations under this Contract. Work includes but is not limited to reinstatement of paved, gravelled and grassed surfaces; sidewalks, curbs and gutters; and ditches and culverts.

### **1.2 Related Sections**

- .1 Cast in Place Concrete: Section 03 30 00
- .2 Excavating, Trenching, and Backfilling: Section 31 23 33
- .3 Asphalt Concrete Paving: Section 32 12 16
- .4 Concrete Walks, Curbs and Gutters: Section 32 16 15
- .5 Grass Seeding (Hydraulic): Section 32 92 20
- .6 Site Water Utility Distribution Piping: Section 33 11 16
- .7 Public Sanitary Utility Sewerage Piping: Section 33 31 13
- .8 Precast Manholes, Catch Basins and Structures: Section 33 39 00
- .9 Storm Utility Drainage Piping: Section 33 41 00

### **1.3 Reference Standards**

- .1 Nova Scotia Transportation and Infrastructure Renewal Specification – Highway Construction and Maintenance.

## **PART 2 – PRODUCTS**

### **2.1 Materials**

- .1 Asphalt Concrete Materials: to Nova Scotia Transportation and Infrastructure Renewal Specification, Division 4, Section 4 – Highway Construction and Maintenance.
- .2 Concrete Materials: to Section 03 30 00.
- .3 Seeding: to Section 32 92 20.

### **2.2 Mixes**

- .1 Asphalt Concrete:
  - .1 Roads: to Section 32 12 16.
  - .2 Walks and Curbs: to Section 32 16 15.
- .2 Portland cement concrete: to Section 03 30 00.

Reinstatement

---

## **PART 3 – EXECUTION**

### **3.1 General**

- .1 Reinstatement all surfaces to lines, elevations and dimensions which existed prior to construction and to match abutting surfaces.
- .2 Make good all damage or disturbances to surfaces, survey markers, properties and structures disturbed during construction.

### **3.2 Gravel Surfaces**

- .1 Place, spread, and fine grade to minimum compacted thickness of 150mm for shoulders and other gravel surfaces. Compact at 100% Standard Proctor Density.

### **3.3 Asphalt Concrete Surfaces**

- .1 Make vertical saw cut to full depth of asphalt concrete in straight lines. Cut back 300mm minimum from edge of excavation or beyond to eliminate tension cracks.
- .2 Place or remove gravel to depth indicated.
- .3 Shape, fine grade and compact gravel surface to 100 percent Standard Proctor Density.
- .4 Clean contact surfaces and apply tack coat prior to placing asphalt concrete.
- .5 Place and compact hot-mix, hot-placed asphalt concrete to Section 32 12 16, and to the following minimum thickness or as indicated in the Project Documents:
  - .1 Sidewalk: 50mm
  - .2 Other Surfaces: 75mm

### **3.4 Asphalt Concrete Curbs**

- .1 Cut back existing curb to full cross section, clean asphalt concrete contact surfaces and apply tack coat prior to placing asphalt concrete curb.
- .2 Place hot-mix, hot-placed asphalt concrete to Nova Scotia Transportation and Infrastructure Renewal Standard Specification – Highway Construction and Maintenance. Use curb machine having mould dimensions equal to those of the existing asphalt concrete curb. Hand placing not permitted unless approved by Engineer.

### **3.5 Concrete Walks, Curbs, and Gutters**

- .1 Construct concrete walks, curbs and gutters to Section 32 16 15.
- .2 Terminate reinstatement at nearest existing control joint or as directs.

### **3.6 Landscaped Surfaces**

- .1 Fine grade to smooth surface all areas to be reinstated.

### **3.7 Ditches**

- .1 Re-establish ditches to provide drainage that existed prior to construction.

Reinstatement

---

**3.8 Culverts**

- .1 Repair or replace all damaged culverts with new culverts of same material and to lines, elevations, and dimensions as original unless otherwise indicated.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Section Includes:**

- .1 Materials and installation for water mains, hydrants, valves, valve boxes, and valve chambers, including service connections.

### **1.2 Related Sections**

- .1 Submittal Procedures: Section 01 33 00
- .2 Contract Closeout Procedures and Submittals: Section 01 77 00
- .3 Excavating, Trenching and Backfilling: Section 31 23 33
- .4 Concrete Reinforcement: Section 03 20 00
- .5 Cast-in-Place Concrete. Section 03 30 00

### **1.3 References**

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .1 ANSI/AWWA B300-10 (with AWWA B3004-11), Hypochlorites.
  - .2 ANSI/AWWA B301-10, Liquid Chlorine.
  - .3 ANSI/AWWA B303-05, Sodium Chlorite.
  - .4 ANSI/AWWA C104/A21.4-08, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  - .5 ANSI/AWWA C105/A21.5-10, Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - .6 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings.
  - .7 ANSI/AWWA C110/A21.10-12, Ductile-Iron and Gray Iron Fittings, 3 inch through 48 inch (75 mm through 1200 mm), for Water.
  - .8 ANSI/AWWA C150/A21.50-2008, Thickness Design of Ductile-Iron Pipe.
  - .9 ANSI/AWWA C151/A21.51-09, Ductile-Iron Pipe, Centrifugally Cast, for Water.
  - .10 ANSI/AWWA C153/A21.53-11, Ductile-Iron Compact Fittings for Water Service.
  - .11 ANSI/AWWA C200-12, Steel Water Pipe - 6 in (150 mm) and Larger.
  - .12 ANSI/AWWA C203-08, Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.
  - .13 ANSI/AWWA C205-12, Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 Inch (100 mm) and Larger - Shop Applied.
  - .14 ANSI/AWWA C206-11, Field Welding of Steel Water Pipe.
  - .15 ANSI/AWWA C207-07, Steel Pipe Flanges for Waterworks Service, 4 Inch through 144 Inch (100 mm through 3,600 mm).
  - .16 ANSI/AWWA C208-12, Dimensions for Fabricated Steel Water Pipe Fittings.

Site Water Utility Distribution Piping

---

- .17 ANSI/AWWA C300-11, Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.
- .18 ANSI/AWWA C301-07, Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
- .19 ANSI/AWWA C303-08, Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.
- .20 ANSI/AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service.
- .21 ANSI/AWWA C504-10, Rubber-Seated Butterfly Valves.
- .22 ANSI/AWWA C600-10, Installation of Ductile-Iron Water Mains, and Their Appurtenances.
- .23 ANSI/AWWA C602-11, Cement-Mortar Lining of Water Pipelines - 4 In. (100 mm) and Larger.
- .24 ANSI/AWWA C603-05 Installation of Asbestos Cement Pressure Pipe.
- .25 ANSI/AWWA C651-05, Disinfecting Water Mains.
- .26 ANSI/AWWA C800-05, Underground Service Line Valves and Fittings (Also Included: Collected Standards for Service Line Materials).
- .27 ANSI/AWWA C900-07, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 Inch through 12 Inch (100 mm - 300 mm), for Water Distribution.
- .2 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless.
  - .2 ASTM A 307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - .3 ASTM B 88-05(2011), Standard Specification for Seamless Copper Water Tube Metric.
  - .4 ASTM C 117-13, Standard Test Method for Material Finer Than 75 MU m (No. 200) Sieve in Mineral Aggregates by Washing.
  - .5 ASTM C 136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .6 ASTM C 478M-13, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.
  - .7 ASTM D 698-12, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600 kN-m/m<sup>3</sup>)).
  - .8 ASTM D 2310-06(2012), Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.
  - .9 ASTM D 2657-07, Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
  - .10 ASTM D 2992-12, Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fitting.
  - .11 ASTM D 2996-01(2007)e1, Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe.

Site Water Utility Distribution Piping

---

- .12 ASTM F 714-12a, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- .13 ASTM C 618-12a, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .3 American Water Works Association (AWWA)/Manual of Practice
  - .1 ANSI/AWWA M9-08, Concrete Pressure Pipe.
  - .2 ANSI/AWWA M11-04, Steel Pipe - A Guide for Design and Installation.
  - .3 AWWA M17-06, Installation, Field Testing, and Maintenance of Fire Hydrants.
- .4 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-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.
  - .4 CGSB 41-GP-25M-12, Pipe, Polyethylene, for the Transport of Liquids.
- .5 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A257 Series-09, Standards for Concrete Pipe.
  - .2 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A2005).
    - .1 CAN/CSA A3002, Masonry and Mortar Cement.
  - .3 CSA B137 Series-09, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12).
    - .1 CSA B137.1, Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.
    - .2 CSA B137.3, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.
    - .3 CAN/CSA-G30.18-09, Carbon Steel Bars For Concrete Reinforcement, includes update No. 1 (2012).
    - .4 CAN/CSA-G164-M92(R2002) Hot Dip Galvanizing of Irregularly Shaped Articles.

Site Water Utility Distribution Piping

---

- .6 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .7 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA)
- .8 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual.
- .9 Underwriters' Laboratories of Canada (ULC)
  - .1 .CAN/ULC-S520-07, Hydrants.
  - .2 CAN4-S543-09, Internal-Lug, Quick Connect Couplings for Fire Hose.
- .10 Design and Construction Specifications, Municipal of East Hants.

#### **1.4 Submittals**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform Consultant of proposed source of bedding materials and provide access for sampling at least 4 weeks prior to commencing work.
- .3 Pipe certification to be on pipe.

#### **1.5 Closeout Submittals**

- .1 Provide 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 in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
  - .1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.

#### **1.6 Waste Management and Disposal**

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with the Waste Management Plan.
- .3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic, waste in accordance with the Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, and Regional and Municipal regulations.
- .6 Ensure emptied containers are sealed and stored safely.
- .7 Divert unused metal and wiring materials from landfill to metal recycling facility to the satisfaction of Consultant.

Site Water Utility Distribution Piping

---

- .8 Divert unused concrete materials from landfill to local facility to the satisfaction of Consultant.
- .9 Dispose of unused asbestos cement pipe in accordance with regulations governing disposal of hazardous materials.
- .10 Divert unused aggregate materials from landfill to facility to the satisfaction of Consultant.
- .11 Dispose of unused disinfection material at official hazardous material collections site to the satisfaction of Consultant.
- .12 Do not dispose of unused disinfection material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.
- .13 Fold up metal banding, flatten and place in designated area for recycling.

## **1.7 Scheduling of Work**

- .1 Schedule Work to minimize interruptions to existing services.
- .2 Submit schedule of expected interruptions to Consultant for consent and adhere to interruption schedule as approved by Consultant.
- .3 Notify Consultant minimum of 48 h in advance of 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 unless otherwise authorized.
- .5 Notify HRM fire department of any planned or accidental interruption of water supply to hydrants.
- .6 Provide "Out of Service" sign on hydrant not in use.
- .7 Advise local police department of anticipated interference with movement of traffic.

## **PART 2 – PRODUCTS**

### **2.1 Pipe, Joint and Fittings**

- .1 Ductile Iron Pipe: to AWWA C151, cement mortar lined.
- .2 Fittings: to AWWA C110 or C153, cement mortar lined, minimum pressure rating 1035 kPa for cast, 1720 for ductile.
- .3 Cement Mortar Lining: to AWWA C104. Provide internal seal coat unless otherwise required by Project Documents.
- .4 Joints: gasketted mechanical or push-on to AWWA C111; flanged where indicated, to AWWA C110 with Class 125 flanged ends to ANSI/ASME B16.1.

### **2.2 Valves and Valve Boxes**

- .1 Valves to open in same direction as local standard.
- .2 Gate valves: to ANSI/AWWA C500-02, standard iron body, bronze mounted wedge valves with non-rising stems, suitable for 1.0 MPa with mechanical joints.

Site Water Utility Distribution Piping

---

- .3 Valve Box: composite or cast iron; three piece sliding type adjustable over minimum of 450 mm complete with valve operating extension rod, 30 mm minimum diameter, 25 x 25 mm cross section, of such length that when set on valve operating nut top of rod will not be more than 150 mm below cover.
  - .1 Base to be large round type with minimum diameter of 300 mm.
  - .2 Top of box to be marked "WATER".

## **2.3 Hydrants**

- .1 Hydrants: dry barrel type, to AWWA C502, designed for working pressure of 1035 kPa with two 65 mm threaded hose outlets, one 100 mm threaded pumper connection, 150 mm riser barrel, 134 mm minimum diameter main valve and 150 mm mechanical joint inlet connection. Hydrants to open in direction indicated in Halifax Water Specifications with an operating nut 32 mm square, threads to local connect to CAN4-S543. Provide metal caps. Depth of bury 1.8 m minimum to top of pipe. Provide two hose and one pumper nozzles. Hose nozzles to be two 2.5 inch nozzles, nominal size 3 7/32 inch with 5 threads/inch. Pumper nozzle to be nominal size 4 29/32 inch with 6 threads/inch. Nozzles to be Storz type.
- .2 Hydrant paint: exterior enamel to CAN/CGSB-1.88-92. Colour: to match existing hydrants on site.

## **2.4 Pipe Bedding and Surround Material**

- .1 As indicated and in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete.

## **2.5 Backfill Material**

- .1 As indicated and in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

## **2.6 Pipe Disinfection**

- .1 Liquid chlorine to ANSI/AWWA B303-05 to disinfect water mains or as required by local practices for procedure.
- .2 Undertake disinfection of water mains in accordance with ANSI/AWWA C651.

## **2.7 Anode Packs**

- .1 Zinc Anodes (ZN 24-48) complete with Clamps.

## **2.8 Thrust Restraints**

- .1 Thrust blocks and Anchors: 20 MPa concrete and 15 M, grade 400 reinforcing steel where indicated on drawings and in Halifax Water Specification.

## **2.9 Service Pipe and Fittings**

- .1 Copper tubing: to ASTM B88, type k annealed, minimum pressure rating 1035 kPa.
- .2 Joints: Compressure type, minimum pressure rating 1035 kPa.
- .3 Corporation stop: brass to ASTM B62 and NSF 61-G, compression type, inlet threads to AWWA C800.
- .4 Curb Stop and drain: brass to ASTM B62, and NSF 61-G, compression type joints and O-ring seal.
- .5 Service clamp: bronze body, confined O-ring seal cemented in place and straps suitable for connecting main. Outlet tapped and threaded to AWWA C800.
- .6 Service Box: adjustable type, cast iron bottom section, cast iron Lid with recessed pentagon nut and internal stem to suit depth of bury. Service box to have appropriate foot piece.

## **PART 3 – EXECUTION**

### **3.1 Preparation**

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
  - .1 Inspect materials for defects to the satisfaction of Consultant.
  - .2 Remove defective materials from site to the satisfaction of Consultant.

### **3.2 Trenching**

- .1 Do trenching work in accordance with Section 31 23 33 - Excavating Trenching and Backfilling.
- .2 Trench depth to provide cover over pipe of a minimum of 1.6 m and a maximum depth of 2.0 m below finished grade or as indicated, where minimum cover is not possible, insulate pipe.
- .3 Trench alignment and depth to be to the satisfaction of Consultant prior to placing bedding material and pipe.

### **3.3 Granular Bedding**

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
  - .1 Do not use blocks when bedding pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to at least 100% Corrected Maximum Dry Density to ASTM D 698.

Site Water Utility Distribution Piping

---

- .6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33 - Excavating Trenching and Backfilling with compacted bedding material.

### 3.4 Installation

- .1 Lay pipes to ANSI/AWWA C600-10 and manufacturer's standard instructions and specifications. Do not use blocks except as specified.
- .2 Join pipes in accordance with ANSI/AWWA C600-10 and manufacturer's recommendations.
- .3 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .4 Lay pipes on prepared bed, true to line and grade.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
  - .2 Take up and replace defective pipe.
  - .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3m.
- .5 Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade.
- .6 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .7 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
  - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Position and join pipes with equipment and methods to the satisfaction of Consultant.
- .9 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .10 Align pipes before jointing.
- .11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .12 Avoid displacing gasket or contaminating with dirt or other foreign material.
  - .1 Remove disturbed or contaminated gaskets.
  - .2 Clean, lubricate and replace before jointing is attempted again.
- .13 Complete each joint before laying next length of pipe.
- .14 Minimize deflection after joint has been made.
- .15 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .16 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or to the satisfaction of Consultant.

Site Water Utility Distribution Piping

---

- .17 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .18 Do not lay pipe on frozen bedding.
- .19 Do hydrostatic and leakage test and have results to the satisfaction of Consultant in accordance with Halifax Water Standards.
- .20 Backfill remainder of trench.
- .21 Place watermain pipe so that mid-point of a full length of pipe is over any other pipe crossing at all times.
- .22 Where pipes cross with less than 150 mm clear vertical between them, place a 300 x 300 mm pad of 50 mm extruded polystyrene insulation between them.
- .23 Install zinc anodes on all bends, tees, valves, hydrant bases and copper service connections.

### **3.5 Valve Installation**

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Support valves located in valve boxes or valve chambers by means of bedding same as adjacent pipe. Maximum length of pipe on each end of valve shall be 1 m. Valves not to be supported by pipe.
- .3 Install zinc anodes on all valves.

### **3.6 Hydrants**

- .1 Install hydrants at locations as indicated.
- .2 Install hydrants in accordance with AWWA M17.
- .3 Install 150 mm gate valve and cast iron valve box on hydrant service leads as indicated.
- .4 Set hydrants plumb, with hose outlets parallel with edge of pavement or curb line, with pumper connection facing roadway and with body flange set at elevation of 50 mm above final grade.
- .5 Place concrete thrust blocks as indicated and specified ensuring that drain holes are unobstructed.
- .6 To provide proper draining for each hydrant, excavate pit measuring not less than 1 x 1 x 0.5 m deep and backfill with coarse gravel or crushed stone to level 150mm above drain holes.
- .7 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

### **3.7 Thrust Blocks and Restrained Joints**

- .1 For thrust blocks: do concrete Work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

Site Water Utility Distribution Piping

---

- .2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or to the satisfaction of Consultant.
- .3 Keep joints and couplings free of concrete.
- .4 Do not backfill over concrete within 24 hours after placing.
- .5 Only use restrained joints to the satisfaction of Consultant.

### **3.8 Hydrostatic and Leakage Testing**

- .1 Do tests in accordance with Halifax Water Standards.
- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify Consultant at least 24 hours in advance of proposed tests. .1 Perform tests in presence of Consultant.
- .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Consultant.
- .6 Open valves.
- .7 Expel air from main by slowly filling main with potable water.
  - .1 Install corporation stops at high points in main where no air-vacuum release valves are installed.
  - .2 Remove stops after satisfactory completion of test and seal holes with plugs.
- .8 Thoroughly examine exposed parts and correct for leakage as necessary.
- .9 Apply hydrostatic test pressure in accordance with local practices based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1 hour.
- .10 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .11 Repeat hydrostatic test until defects have been corrected.
- .12 Locate and repair defects if leakage is detected.
- .13 Repeat test until leakage is no longer detected.

### **3.9 Pipe Surround**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying and after Consultant is satisfied with Work in place, surround and cover pipes as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
  - .1 Do not dump material within 0.5 m of pipe.

Site Water Utility Distribution Piping

---

- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 100% Corrected Maximum Dry Density to ASTM D 698.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 100% Corrected Maximum Dry Density to ASTM D 698.

### 3.10 Backfill

- .1 Place backfill in unfrozen condition.
- .2 Place backfill material, above pipe surround, in lifts compatible with compaction equipment (not to exceed 300 mm), up to grades as indicated.
- .3 Compact backfill in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

### 3.11 Painting of Hydrants

- .1 After installation, paint hydrants as approved by authority having jurisdiction.
- .2 After hydrant flow tests, paint caps and ports to meet colour selections approved by authority having jurisdiction.

### 3.12 Flushing and Disinfecting

- .1 Flushing and disinfecting operations: witnessed by Consultant.
  - .1 Notify Consultant at least 4 days in advance of proposed date when disinfecting operations will begin.
- .2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.
- .3 Flushing flows as follows:

Pipe NPS	Size	Flow (L/s) Minimum
6 and below		18
8		75
10		115
12		150

- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 When flushing has been completed to Consultants satisfaction, introduce strong solution of chlorine as to the satisfaction of Consultant into water main and ensure that it is distributed throughout entire system.
- .7 Rate of chlorine application to be proportional to rate of water entering pipe.

Site Water Utility Distribution Piping

---

- .8 Chlorine application to be close to point of filling water main and to occur at same time.
- .9 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .10 Flush line to remove chlorine solution after 24 hours.
- .11 Measure chlorine residuals at extreme end of pipe-line being tested, use purpose specific testing ports for sampling, not fire hydrants.
- .12 Perform bacteriological tests on water main, after chlorine solution has been flushed out.
  - .1 Take samples daily for minimum of two days and test at a Certified Health Lab.
  - .2 Should contamination remain or recur during this period, repeat disinfecting procedure.
- .13 Take water samples at purpose specific and service connections, in suitable sequence, to test for chlorine residual.
- .14 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for 24 hours.
  - .1 After 24 hours, take further samples to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

### **3.13 Surface Restoration**

- .1 After installing and backfilling over water mains, restore surface to original condition to the satisfaction of Consultant.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Section Includes**

- .1 Materials and installation for gravity sewers

### **1.2 Related Sections**

- .1 Excavating Trenching and Backfilling: Section 31 23 33
- .2 Reinstatement: Section: 32 31 13
- .3 Precast Manholes, Catch basins, and Structures Section: 33 39 00
- .4 Cast-in-Place Concrete: Section 03 30 00

### **1.3 References**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM C 117-13, Standard Test Method for Material Finer Than 75 MU m (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D 698-12, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft<sup>4</sup>-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .4 ASTM D 3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .2 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 Canadian Standards Association (CSA International)
    - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .2 CSA B1800-11, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
      - .1 CSA B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.
      - .2 CSA B182.2, PVC Sewer Pipe and Fittings (PSM Type).
    - .3 CSA B182.11, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.
- .3 Design and Construction Specifications, Municipal of East Hants.

Public Sanitary Utility Sewerage Piping

---

#### **1.4 Definitions**

- .1 Pipe section is defined as length of pipe between successive manholes and/or between manhole and any other structure which is part of sewer system.

#### **1.5 Submittals**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform the Engineer at least 2 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .3 Ensure certification is marked on pipe.

#### **1.6 Scheduling**

- .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 the Engineer 24 hours minimum in advance of any interruption in service.

### **PART 2 - PRODUCTS**

#### **2.1 Plastic Pipe**

- .1 .Type PSM Polyvinyl Chloride (PVC): to CSA-B182.2-11.
  - .1 Standard Dimensional Ratio (SDR): 28 for pipe equal to or less than 150mm in diameter, 35 for a pipe greater than 150mm diameter.
  - .2 Locked-in gasket and integral bell system.
  - .3 Nominal lengths: 6 m.

#### **2.2 Service Connections**

- .1 Type PSM Poly (Vinyl) Chloride: to CSA-B182.2-11.
- .2 Plastic pipe: to CSA B182.1-95, with push-on joints.

#### **2.3 Cement Mortar**

- .1 Portland cement: to CSA A8/A5/A362-93.
- .2 Mix mortar one part by volume of cement to two parts of clean, sharp sand mixed dry.
  - .1 Add only sufficient water after mixing to give optimum consistency for placement.
  - .2 Do not use additives.

#### **2.4 Pipe Bedding and Surround Materials**

- .1 As indicated and in accordance with Section 31 23 33 - Excavating, Trenching, and Backfilling.

Public Sanitary Utility Sewerage Piping

---

- .2 Concrete mixes and materials for cradles, encasement, supports to Section 03 30 00 - Cast-in-Place Concrete.

## **2.5 Backfill Material**

- .1 As indicated and in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

## **PART 3 - EXECUTION**

### **3.1 Preparation**

- .1 Clean and dry pipes and fittings before installation.
- .2 Pipes and fittings to be to the satisfaction of the Engineer prior to installation.

### **3.2 Trenching**

- .1 Do trenching Work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Do not allow contents of any sewer or sewer connection to flow into trench.
- .3 Trench alignment and depth to be to satisfaction of the Engineer prior to placing bedding material and pipe.

### **3.3 Granular Bedding**

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layer, not exceeding 150 mm compacted thickness to depth as indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
- .4 Do not use blocks when bedding pipe.
- .5 Shape transverse depressions in bedding as required to suit joints.
- .6 Compact each layer full width of bed to at least 100% Corrected Maximum Dry Density to ASTM D 698.
- .7 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted Type 2 gravel to 100% Corrected Maximum Dry Density to ASTM D 698.

### **3.4 Installation**

- .1 Lay and join pipes in accordance with manufacturer's recommendations and to satisfaction of the Engineer.
- .2 Handle pipe using methods to the satisfaction of the Engineer.
  - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.

Public Sanitary Utility Sewerage Piping

---

- .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Begin 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 and only deflect pipe joints with the approval of the Engineer.
- .6 Do not allow water to flow through pipe during construction, except as may be permitted by the Engineer.
- .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 0.45 m from side of structure.
  - .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .10 When stoppage of Work occurs, block pipes to the satisfaction of the Engineer to prevent creep during down time.
- .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
  - .1 As indicated;
  - .2 Pipe to manhole connecting gaskets to manufacturers specifications and recommendations;
  - .3 Use shrinkage compensating grout when suitable gaskets are not available.

### **3.5 Pipe Surround**

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after the Engineer is satisfied with pipe joints, surround and cover pipes and backfill to grade.

Public Sanitary Utility Sewerage Piping

---

- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .4 Do not dump material within 0.5 m of pipe.
- .5 Place layers uniformly and simultaneously on each side of pipe.
- .6 Compact each layer from pipe invert to depth as indicated at least 100% Corrected Maximum Dry Density to ASTM D 698.
- .7 Compact each layer from mid height of pipe to underside of backfill to at least 100% Corrected Maximum Dry Density to ASTM D 698.

### 3.6 Backfill

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in lifts compatible with compaction equipment (not to exceed 300 mm), up to grades as indicated.
- .3 Compact backfill in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

### 3.7 Field Testing

- .1 If water used for flushing or testing is obtained from a potable water supply, the potable water supply is to be continuously separated from the service being flushed or tested by an air gap or a level or protection equal to or greater than that provided by a double check valve backflow prevention device.
- .2 Test each section of sewer. A section is the length of pipe between successive manholes or termination points, including service connections to the street line or termination point.
- .3 Provide labour, equipment and materials required to perform testing.
- .4 Notify the Engineer at least 24 hours in advance of all proposed tests. Perform tests in presence of the Engineer.
- .5 Flush sewers and related appurtenances to remove foreign materials.
- .6 Exfiltration test:
  - .1 Fill section with water to displace air from main and service connections. Fill section. No increase in infiltration rate will be allowed if head exceeds 750 mm.
  - .2 Install watertight plug at upstream end of section.
  - .3 Discontinue dewatering minimum of 3 days before taking test measurements.
  - .4 Place 90 degree V-notch weir, in invert of main at downstream end of section. Add water until flow is observed through notch.
  - .5 Measure and record total volume of flow for one hour.
- .7 Allowable leakage: determined by the following formula:

$$L = F \times D \times S / 100$$

where:

L = allowable leakage in litres per hour

Public Sanitary Utility Sewerage Piping

---

D = Diameter in mm

S = Length of section, in metres

F = leakage factor, (litres per hour per mm of diameter per 100 metres of sewer):

Exfiltration Test: Porous Pipe F = 0.12 litre

Non-Porous Pipe F = 0.02 litre

Infiltration Test: Porous Pipe F = 0.10 litre

Non-Porous Pipe F = 0.02 litre

- .8 Low Pressure Air Testing Caution: for safety of personnel and public, observe proper precautions during air testing. Use test equipment designed to operate aboveground. Do not permit personnel in trench during testing. Do not air test pipe with diameter greater than 600 mm.
- .9 Provide air testing equipment meeting the following requirements:
  - .1 Air Blower: 14 litres/sec, maximum pressure 70 kPa continuous.
  - .2 Pressure Relief Valve: Sized to relieve full blower capacity at maximum blower pressure. Range 20 - 70 kPa, adjustable.
  - .3 Pressure Gauges: Range 0 to 70 kPa with accuracy +/- 0.25 kPa.
- .10 Provide plugs at each end of section, with one plug equipped for air inlet connection.
- .11 Fill test section slowly until a constant pressure of 28 kPa is reached. If ground water is above section being tested, the Engineer may recommend increase in air pressure.
- .12 Allow minimum 2 minutes for air temperature to stabilize, adding only amount of air required to maintain pressure.
- .13 After 2 minute period, shut off air supply.
- .14 Decrease pressure to 24 kPa. Measure time required for pressure to reach 17 kPa. Minimum time allowed for pressure drop is as follows: Pipe Diameter (mm) Minimum Time  
Min:Sec 100 1:53 150 2:50 200 3:47 250 4:43 300 5:40 375 7:05 450 8:30 525 9:55 600 11:20.
- .15 Locate and repair defects if test fails. Retest.
- .16 Repair visible leaks regardless of test results.

### 3.8 Deflection Testing

- .1 Conduct closed circuit television inspection procedures to meet North American Association of Pipeline Inspectors (NAAPI) and the WRC Standard.
- .2 Equipment:
  - .1 Provide equipment meeting following requirements:
    - .1 Self-contained monitoring unit and pan-tilt camera with remotely controlled lighting system capable of varying the illumination.
    - .2 Picture quality shall produce continuous 600-line resolution picture, showing entire periphery of pipe.

Public Sanitary Utility Sewerage Piping

---

- .3 A meter device with readings above ground or marking on cable to clearly identify exact location of camera.
- .3 Inspection:
  - .1 Perform inspection of pipe from manhole to manhole by passing TV camera through sewer in direction of flow.
  - .2 Classify results in accordance with North American Pipeline Inspectors (NAAPI) and WRC Standard.
- .4 Records:
  - .1 Maintain inspection record in log form, during television inspection.
  - .2 Log to include location of each fault and fitting distance measured from centreline of reference manhole and position referenced to axis of pipe.
  - .3 Photograph fault from the television screen. All photographs to be clear and precise with distinct definition of fault.
  - .4 Include detailed technical description with photographs as supporting data for each fault.
  - .5 All photos and videos to be in colour.
- .5 Reports:
  - .1 Provide a composite report of TV inspection. Enclose report in binder on letter size paper. Include following pages and information.
    - .1 Title page identifying project, camera operator and dates of inspection.
    - .2 Index page identifying street name, section from manhole to manhole, page number or numbers where information for section is contained.
  - .2 Organize inspection records in sequence from upstream manhole to downstream manhole.
  - .3 Report on each sewer main section to contain:
    - .1 Heading:
      - .1 Street name.
      - .2 Manhole numbers applicable to section.
      - .3 Reference drawing number, if applicable.
      - .4 Weather on the day of inspection.
      - .5 Statement of soil condition in area of inspection, i.e., dry, damp, wet, frozen.
      - .6 Date of inspection.
    - .2 Key Plan, showing corresponding manhole numbers, magnetic north, horizontal distance, pipe and material between manholes, and direction of flow.
    - .3 Inspection findings for each sewer main section to include:
    - .4 Location of all faults.

Public Sanitary Utility Sewerage Piping

---

- .5 Photographs of all faults.
- .6 Location of all service laterals.
- .4 Mount photographs on left-hand page and place corresponding description on right-hand page. Number all photographs in order. Number beside photograph to correspond with description number.
- .5 Enclose all pages of report in transparent sheet protector.
- .6 Accuracy:
  - .1 Maximum permissible error in accuracy to be within following limits of fault location:
    - .1 Up to 375 mm pipe:  $\pm 75$  mm per 100 m of length.
    - .2 450 mm - 600 mm pipe:  $\pm 150$  mm per 100 m of length.
    - .3 750 mm - 900 mm pipe:  $\pm 225$  mm per 100 m of length.
- .7 Video Tapes:
  - .1 Supply a complete record of all inspections on digital format.
  - .2 Index all tapes, listing sections of inspections.
  - .3 Submit DVD/CD's with written reports to the Engineer.
- .8 Repeat Inspection:
  - .1 Repair faults detected during television inspection. Repeat television inspection at no cost to Owner.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 Work Included**

- .1 This section specifies requirements for constructing precast concrete manholes, catchbasins and structures. Work includes supply and installation of concrete bases, precast sections, metal castings and testing.

### **1.2 Related Sections**

- .1 Cast in Place Concrete: Section 03 30 00
- .2 Metal Fabrications: Section 05 50 00
- .3 Excavating, Trenching and Backfilling: Section 31 23 33
- .4 Site Water Utility Distribution Piping: Section 33 11 16
- .5 Public Sanitary Utility Sewerage Piping: Section 33 31 13
- .6 Storm Utility Drainage Piping: Section 33 41 00

### **1.3 Reference Standards**

- .1 ASTM A48/A48M-03 (R2013), Gray Iron Castings.
- .2 ASTM C478M-2012a, Precast Reinforced Concrete Manhole Sections (Metric).
- .3 CAN/CSA A257 Series-09, Standard for Concrete Pipe and Manhole Sections.
- .4 Can/ULC S701-2011, Thermal Insulation, Polystyrene Boards and Pipe Covering.
- .5 Design and Construction Specifications, Municipal of East Hants.

### **1.4 Shop Drawings**

- .1 Submit shop drawings for items listed in accordance with 01 33 00 Submittal Procedures.

### **1.5 Handling and Storage**

- .1 Prevent damage to materials during storage and handling.
- .2 Store gaskets in cool location out of direct sunlight, and away from petroleum products.

## **PART 2 - PRODUCTS**

### **2.1 General**

- .1 Diameter and type: as indicated.

### **2.2 Precast Bases and Sections**

- .1 Precast Concrete Bases and Sections: to ASTM C478M or CSA A257.

Precast Manholes, Catch Basins, and Structures

---

**2.3 Gaskets**

- .1 O-Rings: to manufacturer's recommended compound.
- .2 Bituminous compound: precast manufacturer's recommended compound.

**2.4 Metal Castings**

- .1 Frames, Manhole covers: to ASTM A48, gray cast iron, factory coated.
- .2 Catch Basin grates as indicated on drawings.

**2.5 Waterproofing**

- .1 Waterproofing: type specified in accordance with the latest addition of Halifax Water Standard Specifications.

**2.6 Insulation**

- .1 Rigid Insulation: to CAN/ULC S701, Type 4, extruded polystyrene.

**2.7 Concrete**

- .1 Concrete: slump 80mm  $\pm$ 20mm minimum compressive strength of 35 MPa, and maximum water cement ratio of 0.45, air entrainment, 5 – 8% total air content.
- .2 Grade Adjustment: manufactured type or cast-in-place type as indicated.

## **PART 3 – EXECUTION**

### **3.1 Preparation**

- .1 Inspect products for defects and remove defective products from site.

### **3.2 Excavation and Backfill**

- .1 Excavate and backfill to Section 31 23 33

### **3.3 Installation**

- .1 Construct units as indicated.
- .2 Complete units as pipe laying progresses.
- .3 Cast or set base on 150mm thick pipe bedding or material as indicated in the Project Documents compacts to 90% Standard Proctor Density or as indicated. Top of base to be level.
- .4 Place stubs at elevations and in positions indicated. Provide flexible pipe joints within 1 metre of outside face of poured-in-place and precast structure where there is no in-wall gasket for pipe sizes up to and including 750mm diameter.
- .5 Form manhole bases to provide smooth U-shaped channels with depth equal to diameter of pipes or as indicated. Curve channels smoothly and slope uniformly from inlet to outlet. Benching to drain towards channel, 4% maximum slope.
- .6 Install base section of precast shafting on cast-in-place base as indicated and assure watertight joint.
- .7 Install gaskets in accordance with manufacturer's published instructions.
- .8 Install precast sections plumb and true with opening centered over upstream pipe.
- .9 Make all joints watertight in sanitary sewer manholes and valve chambers.
- .10 Install ladder if required by Project documents.
- .11 Set frame and cover or grating to elevation and slope indicated. Use cast-in-place concrete for adjustment and secure frame in place with cement grout or use manufactured type.
- .12 Clean debris and foreign material from unit. Remove fins and sharp projections. Prevent debris from entering system.

### **3.4 Installation in Existing System**

- .1 Installing units in existing systems:
  - .1 Where new unit is to be installed in existing run of pipe, confirm 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.

Precast Manholes, Catch Basins, and Structures

---

- .3 Where deemed expedient to maintain services 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 or flows, blocking unused pipes or other necessary work.

### **3.5 Adjusting Tops of Existing Units**

- .1 Remove existing gratings and frames and store for re-use at locations designated by Engineer.
- .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 600mm use standard moduloc or grade rings.
- .3 Monolithic Units:
  - .1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation.
  - .2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.
  - .3 When monolithic units with tapered upper section are to be lowered more than 150mm, 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.
  - .4 Install additional manhole ladder rungs in adjusted portion of units as required.
  - .5 Re-use existing gratings, frame as directed by the Engineer.
  - .6 Re-set gratings and frames to required elevation on full bed of cement mortar, parge and trowel smooth.

### **3.6 Sealing Over Existing Units**

- .1 Fill with cast-in-place concrete approved by Engineer.

### **3.7 Testing**

- .1 Test sanitary sewer manholes and structures.
- .2 Provide labour, equipment and materials required to perform testing.
- .3 Backfill prior to testing.
- .4 Notify Engineer 24 hours in advance of proposed test. Do test in presence of Engineer.
- .5 Test method; as indicated and in accordance with the authority having jurisdiction.
- .6 Perform water test as follows:

Precast Manholes, Catch Basins, and Structures

---

- .1 If water used for flushing or testing is obtained from a potable water supply, the potable water supply is to be continuously separated from the service being flushed or tested by an air gap or a level of protection equal to or greater than that provided by a double check valve backflow prevention device.
- .2 Plug all inlet and outlet pipes with watertight plugs.
- .3 Fill with water to top of precast sections.
- .4 Allow time for initial absorption.
- .5 Measure and record volume of water required to maintain level for one hour.
- .6 Leakage not to exceed 5.0 litres per hour per 1000mm diameter per 100mm of height above groundwater.
- .7 Locate and repair defects if test fails. Retest using same methodology.
- .8 Repair leaks regardless of test results.
- .7 Vacuum testing as follows:
  - .1 Plug all inlet and outlet pipes. Restrain plugs.
  - .2 Place and seal vacuum tester head on the manhole frame.
  - .3 Draw vacuum of 250mm Hg on the manhole and measure the time for the vacuum to drop to 225mm Hg.
  - .4 Time to be not less than 45, 50, 65, and 80 seconds for the manhole diameters of 1050mm, 1200mm, 1500mm, and 1800mm respectively.
  - .5 For manholes deeper than 6 metres, increase test times by 2 seconds per 300mm of additional manhole depth.
  - .6 Locate and repair defects if test fails. Retest using same methodology.
  - .7 Repair leaks regardless of test results.

**END OF SECTION**

Storm Utility Drainage Piping

---

## **PART 1 – GENERAL**

### **1.1 Section Includes**

- .1 Materials and installation for storm sewer.

### **1.2 Related Sections**

- .1 Cast in Place Concrete: Section 03 30 00
- .2 Metal Fabrications: Section 05 50 00
- .3 Excavating, Trenching and Backfilling: Section 31 23 33
- .4 Precast Manholes, Catch basins, and Structures: Section 33 39 00
- .5 Reinstatement: Section 32 98 00

### **1.3 References**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM C 14M-11, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
  - .2 ASTM C 76M-11, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
  - .3 ASTM C 117-13, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .4 ASTM C 136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .5 ASTM C 443M-12, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
  - .6 ASTM D 698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .7 ASTM D 1056-07, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
  - .8 ASTM D 2680-01(2009), Standard Specification for Acrylonitrile- Butadiene- Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
  - .9 ASTM D 3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  - .10 ASTM F 794-03(2009), Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
- .2 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 Canadian Standards Association (CSA International)

### Storm Utility Drainage Piping

---

- .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .1 CAN/CSA A3001, Cementitious materials for use in concrete.
- .2 CAN/CSA-A257 Series-09, Standards for Concrete Pipe.
- .3 CSA B1800-11, Plastic Non-pressure Pipe Compendium - B1800 Series (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
  - .1 CAN/CSA-B182.2, PVC Sewer Pipe and Fittings (PSM Type).
  - .2 CAN/CSA-B182.4, Profile PVC Sewer Pipe and Fittings.
  - .3 CSA B182.11-11, Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.
- .4 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .5 Design and Construction Specifications, Municipal of East Hants.

#### **1.4 Definitions**

- .1 A pipe section is defined as length of pipe between successive catchbasins and/or manholes or building connection points.

#### **1.5 Submittals**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures (Shop drawings and product data for manholes, catch basins, frame covers, gratings, piping, fittings and connection to drainage structure).
- .2 Inform Consultant at least four (4) weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .3 Certification to be marked on pipe.
- .4 Submit to Consultant one (1) copy of manufacturer's installation instructions.

#### **1.6 Scheduling**

- .1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.
- .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

### **PART 2 - PRODUCTS**

#### **2.1 Concrete Pipe**

- .1 Reinforced circular concrete pipe and fittings: to CAN/CSA-A257 Series-09, ASTM C 76M-11 diameter as indicated, strength Class III except as indicated otherwise, designed for flexible rubber gasket joints to ASTM C 443M-12, CAN/CSA-A257 Series-03.
- .2 Lifting holes:

## Storm Utility Drainage Piping

---

- .1 Pipe 900 mm and less diameter: no lift holes.
- .2 Pipe greater than 900 mm diameter: lift holes not to exceed two in 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 3034-08 and CSA-B182.2.
  - .1 Standard Dimensional Ratio (SDR): 28 for pipe equal to or less than 150 mm in diameter, 35 for a pipe greater than 150 mm diameter.
  - .2 Locked-in gasket and integral bell system.
  - .3 Nominal Lengths: 6m.

### 2.3 Pipe Bedding and Surround Material

- .1 Pipe bedding and surrounding material as indicated and in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Concrete mixes and materials for bedding, cradles, encasement, supports: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

### 2.4 Backfill Material

- .1 As indicated and in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Backfill under apron closure strip with unshrinkable fill.

### 2.5 Joint Mortar

- .1 Portland cement: to ASTM C150/C150M-12.
- .2 Mortar: one part Portland cement to two parts clean sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

## PART 3- EXECUTION

### 3.1 Preparation

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to the satisfaction of Consultant.

### 3.2 Trenching

- .1 Do trenching Work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Do not allow contents of sewer or sewer connection to flow into trench.
- .3 Trench alignment and depth as per the profile section and to the satisfaction of Consultant prior to placing bedding material and pipe.

Storm Utility Drainage Piping

---

### 3.3 Granular Bedding

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 100% Corrected Maximum Dry Density to ASTM D 698.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

### 3.4 Installation

- .1 Lay and join pipe in accordance with manufacturer's recommendations and to the satisfaction of Consultant.
- .2 Handle pipe using methods approved by Consultant.
  - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Begin 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 pipes during construction except as may be permitted by Consultant.
- .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 B182.11-11.
- .9 When any stoppage of Work occurs, restrain pipes to the satisfaction of Consultant, to prevent "creep" during down time.
- .10 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.
- .11 Make watertight connections to manholes and catch basins.
  - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .12 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
  - .1 Joint to be structurally sound and watertight.

### Storm Utility Drainage Piping

---

- .13 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

### 3.5 Pipe Surround

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Consultant is satisfied with pipe joints, surround and cover pipes as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
  - .1 Do not dump material within 0.5 m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 100% Corrected Maximum Dry Density to ASTM D 698-12.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 100% Corrected Maximum Dry Density to ASTM D 698-12.

### 3.6 Backfill

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround, in uniform lifts compatible with compaction equipment (not to exceed 300 mm), up to grades as indicated.
- .3 Compact in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

### 3.7 Deflection Testing

- .1 Conduct closed circuit television inspection procedures to meet North American Association of Pipeline Inspectors (NAAPI) and the WRC Standard. Conduit deflection testing and video inspection for all storm sewer mains and catch basin leads.
- .2 Equipment:
  - .1 Provide equipment meeting following requirements:
    - .1 Self-contained monitoring unit and pan-tilt camera with remotely controlled lighting system capable of varying the illumination.
    - .2 Picture quality shall produce continuous 600-line resolution picture, showing entire periphery of pipe.
    - .3 A meter device with readings above ground or marking on cable to clearly identify exact location of camera.
- .3 Inspection:
  - .1 Perform inspection of pipe from manhole to manhole by passing TV camera through sewer in direction of flow.
  - .2 Classify results in accordance with North American Pipeline Inspectors (NAAPI) and WRC Standard.

Storm Utility Drainage Piping

---

.4 Records:

- .1 Maintain inspection record in log form, during television inspection.
- .2 Log to include location of each fault and service lateral distance measured from centreline of reference manhole and position referenced to axis of pipe.
- .3 Photograph fault from the television screen. All photographs to be clear and precise with distinct definition of fault.
- .4 Include detailed technical description with photographs as supporting data for each fault.
- .5 Provide minimum of two photographs for each sewer main section televised, detailing typical joint, and typical building service lateral.
- .6 All photos and videos to be in colour.

.5 Reports

- .1 Provide a composite report of TV inspection. Enclose report in binder on letter size paper. Include following pages and information.
  - .1 Title page identifying project, camera operator and dates of inspection.
  - .2 Index page identifying street name, section from manhole to manhole, page number or numbers where information for section is contained.
- .2 Organize inspection records in sequence from upstream manhole to downstream manhole.
- .3 Report on each sewer main section to contain:
  - .1 Heading:
    - .1 Street name.
    - .2 Manhole numbers applicable to section.
    - .3 Reference drawing number, if applicable.
    - .4 Weather on the day of inspection.
    - .5 Statement of soil condition in area of inspection, i.e., dry, damp, wet, frozen.
    - .6 Date of inspection.
  - .2 Key Plan, showing corresponding manhole numbers, magnetic north, horizontal distance, pipe and material between manholes, and direction of flow.
  - .3 Inspection findings for each sewer main section to include:
    - .4 Location of all faults.
    - .5 Photographs of all faults.
    - .6 Location of all service laterals.
  - .7 One photograph each of typical joint and typical when service laterals faults are not found.

Storm Utility Drainage Piping

---

- .4 Mount photographs on left-hand page and place corresponding description on right-hand page. Number all photographs in order. Number beside photograph to correspond with description number.
- .5 Enclose all pages of report in transparent sheet protector.
- .6 Accuracy:
  - .1 Maximum permissible error in accuracy to be within following limits of fault location:
    - .1 Up to 375 mm pipe:  $\pm 75$  mm per 100 m of length.
    - .2 450 mm - 600 mm pipe:  $\pm 150$  mm per 100 m of length.
    - .3 750 mm - 900 mm pipe:  $\pm 225$  mm per 100 m of length.
- .7 Video Tapes:
  - .1 Supply a complete record of all inspections on digital format.
  - .2 Index all tapes, listing sections of inspections.
  - .3 Submit DVD/CD's with written reports to Consultant.
- .8 Repeat Inspection:
  - .1 Repair faults detected during television inspection. Repeat television inspection at no cost to Owner.
- .9 Conduct deflection testing and video inspection for all storm sewer mains and catch basin leads.

**END OF SECTION**

Foundation Drainage

---

## **PART 1– GENERAL**

### **1.1 Summary**

- .1 Section includes:
  - .1 Perimeter weepers.
  - .2 Underslab weepers.
  - .3 Geotextile filter cloth.

### **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: Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this section.

### **1.4 Quality Assurance**

- .1 Qualifications:
  - .1 Installers / applicators / erectors: *Provide* work of this section, executed by competent installers with experience in application of *Products*, systems, and assemblies specified.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 Drainage aggregate:
  - .1 Clear 19 mm (3/4") stone.
- .2 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), ASTM D5261.
  - .3 Grab tensile strength: Minimum 445 N (120 Pound Force), ASTM D4632/D4632M-15a.
  - .4 Water flow rate: Minimum 2460 l/min/m2 (60 gpm/ft2), ASTM D4491/D4491M-16.
  - .5 Puncture: Minimum 180 N (41 Pound Force), ASTM D4833/D4833M-08(2013)e1.
  - .6 Apparent Opening Size (AOS): Minimum 0.212 mm (0.008"), ASTM D4751-16.
  - .7 UV stability: 70% at 500 hours, ASTM D4355-07.
  - .8 Acceptable *Products*:
    - .1 Fiberweb, Inc. 'Tygar Geotextiles Tygar 3401'.
    - .2 Tencate 'Mirafi 150N'.

Foundation Drainage

---

.3 Terrafix Geosynthetics Inc. 'Terrafix 270R'.

- .3 Drainage weepers and fittings (weepers): 100 mm (4") minimum diameter, flexible high density polyethylene (HDPE), BNQ 3624-115-2007, 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 Basis of design:

.1 Armtec 'Big O Drain Tubing'.

- .4 Vertical drainage sheet: in accordance with Section 07 14 16.

### **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 indicated sump or 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 Underslab Weepers**

- .1 Install weepers to the following minimum grade to outlets, unless otherwise indicated:
- .1 0.0%.
- .2 Provide manufactured fittings to connect weepers.
- .3 Locate weepers to 200 mm (8") invert below underside of concrete slab, unless otherwise indicated.
- .4 Connect weepers to indicated sump or outlet.
- .5 Coordinate underslab weeper installation with vertical drainage installation.
- .6 After quality control inspection, surround weepers with minimum of 150 mm (6") of drainage aggregate.
- .7 Wrap drainage aggregate with geotextile filter cloth. Overlap filter cloth joints minimum 200 mm (8") and pin cloth together with hot dipped galvanized nails.
- .8 Do not cover completed weeper installation until completion of quality control inspection.

Foundation Drainage

---

**3.3 Field Quality Control**

- .1 Conduct quality control in accordance with Section 01 45 00.

**END OF SECTION**