

# **PROJECT MANUAL VOL. 1**

Issued for Tender

Architectural, Structural, Civil, Landscape

**Town of WS Fire Station 5-2 and YR PRS 20**

**2207**

4902 Aurora Road, Whitchurch-Stouffville

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 DOCUMENT RESPONSIBILITY**

- .2 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 (*Site Servicing*).
  - .3 E - Denotes documents prepared by Electrical Engineer.
  - .4 L - Denotes documents prepared by Landscape Architect.
  - .5 M - Denotes documents prepared by Mechanical Engineer.
  - .6 S - Denotes documents prepared by Structural Engineer.
  - .7 Cx – Denotes documents prepared by Commissioning Agent
- .3 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 30 00: The architect's seal governs only Section 00 30 00 proper, and not the documents listed therein.

### **1.3 PROJECT DIRECTORY**

- .1 Architect (the *Consultant*) (A):

**Thomas Brown Architects Inc.**  
197 Spadina Avenue, Suite 500  
Toronto, Ontario M5T 2C8  
Tel: 416-364-5710
- .2 Structural Engineer (S):

**Salas O'Brien**  
2235 Sheppard Avenue E, Suite 1100  
Toronto, Ontario M2J 5B4  
Tel: 416-635-9970
- .3 Mechanical Engineer (M):

**Regal Consulting Engineers Inc.**  
2359 Royal Windsor Dr Suite 201,  
Mississauga, ON L5J 4S9  
Tel: (905) 855-3010
- .4 Electrical Engineer (E):

**Regal Consulting Engineers Inc.**  
2359 Royal Windsor Dr Suite 201,  
Mississauga, ON L5J 4S9

Tel: (905) 855-3010

.5 Landscape Architect (L):

**Harrington McAvan Ltd.**  
41 Main St Unionville Unit 102  
Unionville, On  
L3R 2E5  
Tel: (905) 294-8282

.6 Civil Engineer (C):

**Politis Engineering Ltd.**  
981 Greenwood Avenue  
Toronto, Ontario  
Tel: 416-429-8645

.7 Commissioning (Cx):

**JLL, Commissioning & Building Analytics**  
235 Yorkland Boulevard  
Suite 500  
North York, ON M2J 4Y8  
Canada

**END OF SECTION**

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

**Document Identification**

**DR**

**VOLUME 1**

**DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS**

00 01 01	Project Manual Title Page	A
00 01 05	Document Responsibility and Project Directory	A
00 01 10	Table of Contents	A
00 30 00	Information Available for Review	A

**DIVISION 01 - GENERAL REQUIREMENTS**

01 10 00	General Instructions	A
01 10 00.1	CAD Data Disclaimer	A
01 21 00	Cash Allowances	A
01 25 00	Product Substitution Procedures	A
01 25 01	Request for Substitution Form	A
01 26 00	Contract Modification and Requests for Interpretation	A
01 29 73	Schedule of Values	A
01 31 13	Coordination	A
01 31 19	Project Meetings	A
01 31 46	Field Engineering	A
01 32 00	Construction Progress Documentation	A
01 33 00	Submittals Procedures	A
01 35 18	General Requirements for Energy Efficiency	A
01 35 29	Health, Safety, and Emergency Response	A
01 35 63	General LEED v4 Requirements	A
01 35 66	LEED v4 Project Management and Coordination	A
01 35 90	Indoor Air Quality Management	A
01 35 90.1	Indoor Air Quality Management Schedules	A
01 41 00	Regulatory Requirements	A
01 42 13	Abbreviations and Acronyms	A
01 45 00	Quality Control	A
01 50 00	Temporary Work	A
01 56 39	Temporary Tree and Plant Protection and Trimming	A
01 53 13	Construction Activity Pollution Prevention	A
01 57 20	Temporary Indoor Air Quality Control	A
01 60 00	Products and Workmanship	A
01 60 13	LEED v4 Product Requirements	A
01 73 29	Cutting and Patching	A
01 74 13	Progressive Cleaning	A
01 74 19	Waste Management for LEED v4	A
01 76 00	Protecting Installed Construction	A
01 77 00	Contract Closeout Procedures and Submittals	A
01 78 23	Operations and Maintenance Manuals	A
01 78 36	Warranties	A



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

<b><u>Document Identification</u></b>	<b><u>DR</u></b>
01 78 39 As-Built Documents	A
01 81 14 Indoor Air Quality Testing and Flush-out for LEED v4	A
01 81 19 Indoor Air Quality Management LEED v4	A
01 91 00 Commissioning Requirements	Cx
01 91 19 Building Envelope Commissioning	Cx

## **DIVISION 02 - EXISTING CONDITIONS**

02 27 00 Erosion and Sediment Control	C
02 52 30 Concrete Curb and Toe Walls	C
02 83 20 Retaining Walls	C

## **DIVISION 03 – CONCRETE**

03 30 53 Cast-In-Place Concrete	S
---------------------------------	---

## **DIVISION 04 – MASONRY**

04 05 00 Masonry Procedures	A
04 05 13 Mortar and Grout for Masonry	A
04 05 19 Masonry Reinforcement and Connectors	A
04 05 23 Masonry Accessories	A
04 21 00 Brick Masonry Units	A
04 21 10 Stone Masonry Units	A
04 22 00 Concrete Masonry Units	A

## **DIVISION 05 – METALS**

05 04 00 Hot-Dip Galvanizing	A
05 12 13 Architecturally Exposed Structural Steel	S
05 21 19 Structural Steel and Open Web Steel Joist Framing	S
05 31 00 Steel Roof and Floor Decking	S
05 41 00 Cold-Formed Metal Structural Stud Framing	S
05 50 00 Metal Fabrications	A
05 50 01 Post Guard Bollard Covers	A
05 52 00 Handrails and Railings	A

## **DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES**

06 10 53 Rough Carpentry	A
06 40 00 Architectural Woodwork	A

## **DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

07 05 43 Thermal Clips	A
07 11 13 Damp proofing	A
07 13 26 Sheet Waterproofing	A

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

<b><u>Document Identification</u></b>	<b><u>DR</u></b>
07 21 00 Thermal Insulation	A
07 26 13 Above-Grade Vapour Barrier	A
07 26 16 Below-Grade Vapour Barrier	A
07 27 00 Air Barrier Systems	A
07 46 50 Preformed Metal Cladding	A
07 52 16 Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing	A
07 61 00 Sheet Metal Roofing	A
07 62 00 Metal Flashing	A
07 81 00 Sprayed Fire-Resistive Materials (SFRM)	A
07 84 00 Firestopping and Smoke Seals	A
07 92 00 Joint Sealants	A

#### **DIVISION 08 – OPENINGS**

08 11 13 Steel Doors and Frames	A
08 35 13 Four-Fold Metal Doors	A
08 36 13 Sectional Overhead Metal Doors	A
08 41 00 Aluminum Framed Glazing Systems	A
08 53 00 Metal Clad Vinyl Windows	
08 71 00 Door Hardware	H
Hardware Schedule	H
08 71 13 Automatic Door Operators	A
08 80 00 Glass and Glazing	A
08 91 19 Louvres	A

#### **DIVISION 09 – FINISHES**

09 22 00 Metal Supports for Gypsum and Cement Board	A
09 29 00 Gypsum and Cement Board	A
09 31 00 Tiling	A
09 51 23 Acoustical Tile Ceiling Systems	A
09 65 13 Resilient Base	A
09 65 20 Rubber Tile Flooring	A
09 67 23 Epoxy Flooring – ORANGE PEEL	A
09 68 13 Carpet Tile	A
09 91 00 Painting	A

#### **DIVISION 10 – SPECIALTIES**

10 11 00 Visual Display Surfaces	A
10 14 01 Interior Signage	A
10 14 53 Traffic Signage	A

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

<b><u>Document Identification</u></b>	<b><u>DR</u></b>
10 26 13 Corner Guards	A
10 28 00 Washroom Accessories and Janitor Accessories	A
10 50 30 Turnout Gear Lockers – Wall and Frame Mounted	A
10 50 30 Turnout Gear Lockers – Wall Mounted	
10 51 13 Prefinished Metal Lockers	A
10 75 16 Flagpoles	A
 <b>DIVISION 11 – EQUIPMENT</b>	
11 24 00 Fall Arrest Anchors – Horizontal Cable Lifeline System	A
 <b>DIVISION 12 – FURNISHINGS</b>	
12 24 13 Roller Window Shades	A
12 36 61 Solid Surfaces	A
12 58 29 Murphy Beds	A
 <b>DIVISION 31 – EARTHWORK</b>	
31 05 17 Aggregates	C
31 11 00 Clearing and Grubbing	A
31 23 10 Excavating, Trenching, Backfilling	C
31 23 13 Site Grading	C
31 25 00 Erosion and Sedimentation Control	C
31 32 19 Geotextiles	A
 <b>DIVISION 32 - EXTERIOR IMPROVEMENTS</b>	
32 01 90 Exterior Landscape Maintenance	A
32 01 90 Temporary Tree and Plant Protection and Trimming	A
32 11 19 Granular Sub-base	C
32 11 23 Granular Base	C
32 12 16 Asphalt Paving	A
32 13 13 Concrete Sitework	A
32 13 15 Concrete Curbs	L
32 13 16 Concrete Sidewalks	C
32 17 23 Traffic Markings	A
32 17 26 Tactile Warning Surfacing	A
32 31 00 Fences and Gates	A
32 31 13 Chain Link Fences	A
32 31 25 Wood Composite Fences and Gates	A
32 33 00 Site Furnishings	L
32 91 19 Topsoil Placement and Grading	L
32 92 23 Sod	L
32 93 00 Trees-Shrubs, and Ground Cover Planting	L

---

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

**Document Identification**

**DR**

**DIVISION 33 – UTILITIES**

33 05 14	Manholes and Catch basins	C
33 11 17	Water System	C
33 31 13	Sanitary Sewers	C
33 44 00	Storm Sewers	C
33 44 01	Subdrains	C
33 44 16	Precast Trench Drain Systems	A

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

**Document Identification**

**DR**

**VOLUME 2**

**INTRODUCTORY INFORMATION**

00 01 01	Project Manual Title Page	A
00 01 10	Table of Contents	A

**DIVISION 22 – PLUMBING**

22 01 01	General Requirements	M
22 08 00	Plumbing System Commissioning	Cx
22 09 00	Plumbing Piping	M
22 42 01	Plumbing Specialties	M
22 42 02	Plumbing Fixtures & Trim	M
22 47 00	Plumbing Equipment	M
22 60 00	Fuel Gas Piping	M

**DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING**

23 01 01	General Requirements	M
23 08 00	HVAC System Commissioning	Cx
23 05 29	Supports and Anchors	M
23 05 48	Vibration Controls	M
23 05 93	Testing, Adjusting, Balancing	M
23 07 13	Duct Insulation	M
23 07 13	Piping Insulation	M
23 20 00	Furnace & Condensing Unit	M
23 21 00	Hydronic Piping	M
23 21 10	Hydronic Specialties	M
23 21 17	Hydronic Expansion Tank	M
23 23 00	Refrigerant Piping	M
23 25 00	HVAC Water Treatment	M
23 25 10	Energy Recovery Ventilator	M
23 31 00	Duct Work	M
23 34 00	HVAC Fans	M
23 36 00	Air Terminal Units	M
23 37 00	Air Outlets and Inlets	M
23 40 00	Hydronic Pumps	M
23 45 00	Variable Frequency Drive	M
23 52 13	Boiler	M
23 73 00	Roof Top Air-conditioning Unit	M
23 82 00	Terminal Heat Transfer Units	M

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

<b><u>Document Identification</u></b>		<b><u>DR</u></b>
23 82 10	IR Heaters	M
23 84 16	Humidification System	M

## **DIVISION 25 – INTEGRATED AUTOMATION**

25 01 01	General Requirements	M
25 08 00	Integrated Automation Commissioning	Cx
25 90 00	Control Specifications	M
25 90 10	Sequence of Operations	M

## **DIVISION 26 – ELECTRICAL**

26 05 00	Electrical Work General Instructions	E
26 05 05	Basic Electrical Materials and Methods	E
26 05 06	Seismic Control and Restraint	E
26 05 07	Fire Stopping and Smoke Seal System	E
26 05 09	Electrical Work Testing	E
26 05 10	Mounting Heights	E
26 05 21	Conductors (0-1000 Volts)	E
26 05 28	Grounding and Bonding	E
26 05 31	Splitters, Junction and Pull Boxes	E
26 05 32	Outlet Boxes, Conduit Boxes and Fittings	E
26 05 34	Conduit Systems	E
26 05 37	Wireways and Auxiliary Gutters	E
26 05 40	Wiring Devices	E
26 08 00	Electrical System Commissioning	Cx
26 09 23	Occupancy Sensors	E
26 24 01	Service Entrance Equipment	E
26 24 16	Distribution Panelboards	E
26 24 18	Branch Circuit Panelboards	E
26 28 18	Ground Fault Protection Equipment	E
26 32 13	Diesel Generator	E
26 36 23	Automatic Transfer Switch	E
26 50 10	Building Interior Lighting	E
26 50 15	Building Exterior Lighting	E
26 52 00	Emergency Lighting	
26 53 00	Exit Lighting	

## **DIVISION 27 – COMMUNICATIONS**

27 05 00	Grounding & Bonding for Communication Systems	E
27 05 28	Pathways for Communication Systems	E
27 05 53	Identifications for Communications Systems	E
27 08 00	Commissioning of Communications Systems	E
27 11 00	Communications Equipment Room Fittings	E

---

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

<b><u>Document Identification</u></b>	<b><u>DR</u></b>
27 11 19      Terminal Blocks, Patch Panels & Connectors	E
27 15 00      Horizontal Cabling	E
27 16 00      Communications connecting cords devices and adapters	E

#### **DIVISIONS 28 AND 29 – ELECTRONIC SAFETY AND SECURITY**

28 13 00      Access Control	E
28 13 10      Fire Alarm Systems	E
28 20 00      Portable Fire Extinguishers	E

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 INFORMATION AVAILABLE FOR REVIEW**

- .1 Be advised the neither the *Owner* nor the *Consultant* guarantees the accuracy or completeness of any data contained therein. Bidders must satisfy themselves with regard to all matters relating to conditions that may affect either the methods of construction or the cost of the *Work* before submitting bids or commencing the *Work*.
- .2 The Architect's seal, if applied to the *Project Manual*, governs only Section 00 30 00 proper, and not the documents listed herein.
- .3 The following documents have been made available by the *Owner* for review:
  - .1 Geotechnical report:
    - .1 Geotechnical Investigation, Whitchurch-Stouffville and York Region Combined Fire Station/Paramedic, 4902 Aurora Road, dated July 26, 2025, prepared by Patriot Engineering
    - .2 A Geotechnical Investigation for Proposed Land Acquisition, 4902 Aurora Road, dated November 2023, prepared by Soil Engineers Ltd.
  - .2 Environmental *Site* Assessment reports:
    - .1 Butternut Health Expert's Report, dated August 18, 2024, prepared by Williams & Associates Forestry Consultants Ltd.
  - .3 Stormwater Management reports
    - .1 Stormwater Management Brief for a Proposed Fire Station and York Region PRS Station, 4902 Aurora Road, Whitchurch-Stouffville, Ontario, dated March 2025, prepared by Politis Engineering Ltd.
- .4 *Contractor* must confirm receipt of these documents prior to commencement of construction.

**END OF SECTION**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 LANGUAGE OF THE CONTRACT
- 1.4 THE CONTRACT DOCUMENTS
- 1.5 LAWS, NOTICES, REFERENCES, STANDARDS AND REGULATIONS
- 1.6 PERMITS, DEPOSITS AND RESPONSIBILITIES
- 1.7 PROJECT COORDINATION AND RESPONSIBILITY
- 1.8 EXAMINATION OF THE PLACE OF THE WORK, DOCUMENTS, SURFACES AND CONDITIONS
- 1.9 QUANTITY OF ITEMS
- 1.10 STANDARDS AND CODES
- 1.11 SCHEDULE OF VALUES
- 1.12 DISCREPANCIES AND CLARIFICATIONS
- 1.13 SETTING OUT THE WORK AND FIELD ENGINEERING
- 1.14 PROTECTION AND DAMAGES OF PROPERTY AND WORK
- 1.15 FIRES AND SMOKING
- 1.16 DOCUMENTS AT THE PLACE OF THE WORK
- 1.17 CONCEALED SERVICES
- 1.18 TRADEMARK AND LABELS
- 1.19 WASTE AUDITS/PLANS FOR WASTE REDUCTION
- 1.20 INTERFERENCES
- 1.21 NOT IN CONTRACT ITEMS AND ITEMS SUPPLIED BY OWNER
- 1.22 SEISMIC DESIGN AND REQUIREMENTS
- 1.23 ELECTRONIC FILES

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

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

### **1.3 LANGUAGE OF THE CONTRACT**

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

### **1.4 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 Ontario 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.

## 1.5 LAWS, NOTICES, REFERENCES, STANDARDS AND REGULATIONS

- .1 The Ontario Building Code - Ontario Regulation 332/12, including amendments, 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 It shall be the responsibility of the *Contractor* to give the required notices and comply with the laws, bylaws, ordinances, rules, regulations, codes, and orders of all *Authorities Having Jurisdiction*, which are or become in force during the performance of the *Work*, and which relate to:
  - .1 The *Work*.
  - .2 The preservation of the public health;
  - .3 Environmental protection; and/or,
  - .4 Construction safety.
- .4 *Contractor* shall 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 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.
- .6 The *Contractor* shall *Provide* to the chief building official or the registered code agency, where a registered code agency is appointed under the Ontario Ontario Building Code Act in respect of the construction to which the notice relates, the required notices set out in Division C - Part 1 Sentence 1.3.5.1(2) and Sentence 1.3.5.2 of the Ontario Ontario Building Code, O. Reg. 332/12 as amended. The *Contractor* shall be present at each site inspection by an inspector or registered code agency as applicable under Division C - Part 1 Sentence 1.3.5.2 of the Ontario Building Code.

- .1 It is the responsibility of the *Contractor* to schedule notifications to the chief building official or the registered code agency such that the inspection pertaining to the notifications can be made within the time frame as required under Division C – Part 1 Sentence 1.3.5.3 of the Ontario Building Code, O. Reg. 332/12 as amended, without causing a delay in the *Work*. The *Contractor*, at no additional cost to the *Owner*, shall be solely responsible for any delay in the *Work* caused by failure to properly schedule required notifications and inspections.
- .7 Without limiting the foregoing, wherever bylaws, codes, or standards are quoted in the *Contract Documents*, they shall be taken to mean the latest edition, including all revisions, amendments, or supplements, at the time of the *Contract*, unless an earlier edition is specifically quoted. If more than one bylaw, code, or standard is quoted for a given *Product*, material or method, the latest edition of the most stringent shall govern.
- .8 Wherever reference is made to “manufacturer’s instructions” or “manufacturer’s recommendations”, it shall mean printed instructions or recommendations, received directly from the referenced manufacturer. It shall also be taken to mean the latest edition of such instructions or recommendations.
- .9 The *Contractor* shall be responsible for any delay in the progress of the *Work* due to a violation of any legislated requirements, and shall take the necessary steps to avoid delay in the final completion of the work, and such steps will not be considered or approved as changes in the *Work*.

## 1.6 PERMITS, DEPOSITS AND RESPONSIBILITIES

- .1 *Owner* shall apply and pay for the Building Permit.
- .2 All permits, licenses, certificates, and the like, other than the Building Permit, where required for the *Work*, shall be applied for, paid for, and obtained by the *Contractor*.
- .3 *Contractor* shall obtain all permits required to execute *Work* on municipal rights of way. Obtain damage deposits for sidewalks, roads and services.
- .4 The *Contractor* shall pay for any deposit for clean-up of mud-tracking onto roadways, and for the repair of any damage to roadways adjacent to the *Place of the Work* as may be required by the *Authorities Having Jurisdiction*.

## 1.7 PROJECT COORDINATION AND RESPONSIBILITY

- .1 The *Contractor* shall coordinate the progress of the *Work*, mobilization areas of the *Place of the Work*, progress schedules, submittals, access to and use of the *Place of the Work* and facilities subject to any restrictions and conditions in accordance with the *Contract Documents*, reports and records, and any other processes, events, work, approvals, inspections and testing as may be required for the complete, proper and seamless execution of the *Work*.
- .2 The *Contractor* shall be solely responsible for ensuring that the complete *Contract Documents* are distributed to, or otherwise made available for review by, all *Subcontractors* and suppliers as required for the complete and proper and informed coordination and execution of the *Work*. Failure in this regard will be the sole responsibility of the *Contractor* and will not be accepted as a justification for a change in the *Work* and no change in the *Work* will be approved therefore.
- .3 The *Contractor* is required to employ a competent supervisor and necessary assistants who shall be in attendance at the *Place of the Work* at all times throughout the progress of the *Work* when work is being performed. The *Contractor*, through the supervisor, shall maintain good order and

discipline among the *Contractor's* employees engaged on the *Work*, and among any *Subcontractors* engaged on the *Work*.

- .4 The responsibility as to which *Subcontractor* provides the required materials or articles, and/or builds-in articles, rests solely with the *Contractor* unless otherwise explicitly stated in the *Contract Documents* or directed by the *Consultant*.
- .5 The *Contractor* shall ensure that *Subcontractors* shall give the *Contractor*, in writing, instructions and information regarding their requirements as related to other parts of the *Work*.
- .6 There shall be cooperation at all times between *Subcontractors* as required for the proper execution of the *Work*. The *Contractor* shall ensure that *Subcontractors* supply others with the necessary accessories for building-in where required.
- .7 There shall be cooperation at all times with any representatives of any Inspection and Testing Companies (as may be retained by the *Owner*) during the performance of their duties.
- .8 The *Contractor* shall ensure that each *Subcontractor* shall report to the *Consultant* and the *Contractor*, in writing, any defects of surface or work, prepared by other *Subcontractors*, that adversely affects the work of their trade. Commencement of work shall imply acceptance of the prepared work otherwise.
- .9 The *Contractor* shall ensure that each *Subcontractor*, upon completion of their work, removes any equipment, surplus materials, and debris resulting from their work. Each *Subcontractor* shall also, and at its own expense, make good any damage to the work of another *Subcontractor* as a result of its own work. The definition of what constitutes "damage" shall be at the sole discretion of the *Consultant*.

## **1.8 EXAMINATION OF THE PLACE OF THE WORK, DOCUMENTS, SURFACES AND CONDITIONS**

- .1 Examine the *Place of the Work* and investigate matters relating to the nature of the *Work*, means of access and egress, obstacles, rights and interests of other parties which may be interfered with during the execution of the *Work*, conditions and limitations including obstructions, existing structures or facilities, local conditions, actual levels, character and nature of the *Work*, documents related to existing building or buildings, as applicable and when available, and other consideration which may affect performance of the *Work*.
- .2 Examine the extent of *Work* to be performed and matters which are referred to in the *Contract Documents* prior to start of the *Work*.
- .3 Examine *Work* to which *Work* is to be applied, anchored or connected, and relevant as- built conditions.
- .4 Each *Work* operation following on a previous *Work* operation of a differing *Subcontractor*, 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*.

## **1.9 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*.

## **1.10 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.

## **1.11 SCHEDULE OF VALUES**

- .1 The schedule of values specified under GC 18 shall include line items identifying full costs for the following:
  - .1 Preparation and submission of closeout submittals in accordance with the requirements of Section 01 77 00.

## **1.12 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.

## **1.13 SETTING OUT THE WORK AND FIELD ENGINEERING**

- .1 The *Contractor* shall assume full responsibility for and execute complete layout of the *Work* to required locations, lines and elevations.
- .2 Verify all grades, lines, levels, and dimensions as indicated or otherwise provided, and report errors or inconsistencies to the *Consultant* before commencing work, or as soon as discovered.
- .3 Upon completion of foundation work, *Provide* an accurate survey showing the location of the foundations on the *Site*, the foundation wall dimensions, and the gross floor area of the Foundation Plan. The survey shall be prepared by a surveyor who is a Registered Ontario Land Surveyor acceptable to the *Owner* and the *Consultant*. The cost of the survey shall be part of the *Contract Price*.
- .4 Surveys and Survey Requirements:
  - .1 Surveyor shall be an Ontario Land Surveyor, acceptable to the *Owner* and the *Consultant*.
  - .2 Locate, confirm, and protect control points prior to starting *Work*. Preserve permanent reference points throughout the *Work*.
  - .3 Establish two permanent benchmarks on *Site*, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in the Project Record Documents described under Section 01 77 00 Project Closeout.
  - .4 Establish lines and levels, locate and lay out by instrumentation.

- .5 The *Contractor* shall *Provide* all *Subcontractors* with, and be responsible for, all levels and dimensions they require. The *Contractor* to notify all *Subcontractors* that such levels and dimensions must be obtained from the *Contractor* only.
- .6 The *Contractor* shall maintain a complete and accurate log of control and survey work as it progresses.
- .7 Upon completion of foundations and major *Site* improvements, have prepared a certified survey showing dimensions, locations, angles, and elevations of the work completed.
- .8 As the work progresses, the *Contractor* shall be responsible for laying-out the exact locations of walls as a guide to the *Subcontractors*.
- .9 The *Contractor* to ensure that all pipes, service lines and ducts are concealed. Any exceptions to this should be noted on the drawings. Advise the *Consultant* in advance of the installation or fabrication of items where conditions are such that the installation or fabrication will be exposed.

#### **1.14 PROTECTION AND DAMAGES OF PROPERTY AND WORK**

- .1 The *Contractor* shall ensure provision of adequate protection of materials, property, and work from damage and staining and to ensure protection of adjacent materials and work of *Subcontractors* to prevent damage. Any party responsible for damage to the work of another, shall make good such damage to the satisfaction of the *Consultant* at no additional cost to the *Owner*. The cost for such making good will not be considered or approved as a change in the *Work*.
- .2 Maintain access and surrounding areas to the *Place of the Work* free from soiling and debris resulting from the *Work*. Make good any soiling and remove any and all debris caused as a result of the *Work* to the satisfaction of the *Owner* and the *Consultant*.
- .3 All damage to existing sidewalks, fences, structures, curbs, services, roadways, parking and asphalt areas, grounds, sodding, trees, or other items on, or adjacent to, the *Place of the Work*, including mud tracks, deemed by the *Consultant* as being damaged due to the performance of the *Work*, shall be made good by the *Contractor* to the satisfaction of the *Consultant* at no additional cost to the *Owner*. The cost for such making good will not be considered or approved as a change in the *Work*.
- .4 Abide by municipal requirements for maintaining sidewalks and roads in proper condition throughout the course of the *Work*. *Provide* a flag-person as required for the safe ingress and egress of vehicles to and from the *Place of the Work*.
- .5 Floors and roofs shall not be over-loaded by accumulated materials. Place proper supports and braces as required to safely disseminate any temporary loading.

#### **1.15 FIRES AND SMOKING**

- .1 Fires are not permitted at the *Place of the Work*.
- .2 Explosives shall not be used in the execution of the *Work* and are not permitted at the *Place of the Work*.
- .3 Smoking shall be prohibited at the interior of the building at all times. Smoking shall also be prohibited in areas where volatile fumes or liquids are being used. Post "No Smoking" signs accordingly.
- .4 Precautions shall be taken to avoid fire by spontaneous combustion. Remove combustible and non-combustible waste at regular intervals and/or when directed by the *Consultant* or the *Owner*.

## 1.16 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*.
    - .1 The Issued for Construction (IFC) version of the *Contract Documents* shall be the version retained at the *Place of the Work*. The IFC version shall be prepared by the *Consultant* and provided to the *Contractor*.
    - .2 Drawings & Specifications "Issued for Construction" are complementary to the *Contract Documents*. To the best of our knowledge they are an accurate representation of documented revisions. In the case of any discrepancy, omission or conflict between the "Issued for Construction" documents and the *Contract Documents*, the *Contractor* is to promptly bring it to the attention of the architect."
    - .3 In cases of dispute, the original signed version, of the *Contract Documents*, including addenda issued, shall govern over the IFC version.
  - .2 'Reviewed' or 'Reviewed as Modified' shop drawings.
  - .3 Construction and submittal schedules.
  - .4 *Supplemental Instructions, Notices of Change, Change Orders, and Change Directives*.
  - .5 Inspection and Testing 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 Substantial Performance Procedure issued by *Consultant* to *Contractor*
  - .10 Daily log including:
    - .1 Number of *Workers* actively *Working* at the *Place of the Work* by each subcontract.
    - .2 *Subcontractors Working* at the *Place of the Work*.
    - .3 Parts of the *Work* being *Worked* on.
    - .4 *Working* hours *Worked* at the *Place of the Work*.
    - .5 Activities with intermittent progress.
    - .6 Time lost and explanation for such time lost.
    - .7 Difficulties (*Work* scheduled to start but did not with the reason why, delays, labour inefficiencies, labour shortage).
    - .8 Products and materials delivered.
    - .9 Equipment mobilized and/or demobilized.
    - .10 Demolition conditions.

.11 Start and finish date of each part of the *Work*.

.12 *Site* specific information as required by *Owner*.

.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.

#### **1.17 CONCEALED SERVICES**

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

#### **1.18 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.

#### **1.19 WASTE AUDITS/PLANS FOR WASTE REDUCTION**

.1 Comply with requirements of Authorities Having Jurisdiction.

.2 Deliver to nearest appropriate depot materials accepted for recycling by *Region* or Municipality having jurisdiction over the *Place of the Work*, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot scrap and excess gypsum wallboard for recycling of this material. Costs for this *Work* are included in the *Contract Price*.

#### **1.20 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 Authorities Having Jurisdiction 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.

#### **1.21 NOT IN CONTRACT ITEMS AND ITEMS SUPPLIED BY OWNER**

.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*.

.2 SBO (Supplied by *Owner*) shall be used to designate various items of equipment that will be supplied by the *Owner* for installation by the *Contractor* as part of the *Work*.

.3 Install items indicated as supplied by *Owner* (SBO) during the *Work*. Coordinate shipping and delivery with the *Owner*. Store items supplied by *Owner* at the *Place of the Work* and protect from damage. Install completely, and leave in full operating condition, in accordance with manufacturer's directions.



## 1.22 SEISMIC DESIGN AND REQUIREMENTS

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

## 1.23 ELECTRONIC FILES

- .1 Electronic files (CAD) will not be released until Electronic Files Transfer Form, appended to this section, has been completed and returned to the *Consultant*. Requests for release of electronic files for Structural, Mechanical, Electrical, Civil or Landscape will require to be completed on their release forms upon request.
  - .1 *Subcontractors* and *Suppliers* requiring AutoCAD files shall make arrangements with the *Contractor*. The *Consultant* will not *Provide* AutoCAD files directly to *Subcontractors* or *Suppliers*.
  - .2 The *Consultant* will require a copyright waiver, and/or CAD data disclaimer, and/or BIM data disclaimer to be signed by the *Contractor* prior to delivery of such AutoCAD files.
    - .1 Copies of each of these disclaimers are appended to this section for reference.
- .2 The *Consultant* or other *Consultants/subconsultants* may charge a fee for providing the electronic files as indicated in the CAD data disclaimer or otherwise at the *Consultant's* or other *Consultant's/Subconsultant's* discretion.
  - .1 Payment, where required, shall be made directly to the other *Consultant/Subconsultant*, and not through the *Prime Consultant*.
- .3 CAD files shall only be released once payment has been made as stipulated on Electronic Files Transfer Form.

**PART 2 - PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

# CAD DATA DISCLAIMER

**PROJECT NAME** 2207  
**PROJECT ADDRESS** 2960 Teston Road

1. There is a retrieval / preparation fee associated with the release of electronic file requests. The fee is **\$250.00 plus applicable taxes per drawing**. The release of the drawings will be provided once this signed agreement and receipt of payment by e-transfer is provided to [accounts@tbrownarch.com](mailto:accounts@tbrownarch.com).
2. The release of electronic files by **Thomas Brown Architects Inc.** does not imply transfer of copyright and ownership. Electronic files shall remain the property of Thomas Brown Architects Inc., and in no case shall the transfer of these electronic files be considered a sale.
3. The copyright of this CAD data belongs to **Thomas Brown Architects Inc.** and it may not be altered or modified or copied or transferred to another company or individual, either in part or whole, without express written permission from **Thomas Brown Architects Inc.**. This material is being furnished for reference purposes only and has not been specially prepared for use by the recipient.
4. The information on the electronic files is considered instruments of service of **Thomas Brown Architects Inc.** and shall not be used for other projects, for additions to this project, or completion of this project by others.
5. This computer aided design (CAD) data is 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. **Thomas Brown Architects Inc.** makes no warranties, either expressed or implied, of its merchantability and fitness for any particular purpose. The user is further warned that, while all digital CAD data appears to be extremely accurate, this apparent accuracy is an artifact of the techniques used to generate it and is in no way intended to imply actual accuracy. The user of this data takes full responsibility for the accuracy and correctness of all measurements, areas, inventories, etc. extracted from this data either manually or with the use of a computer.
6. The user is advised that any translation of CAD data from one computer system or environment to another can and often does result in the loss of important data. This loss can include, but may not be limited to: portions of text and dimensions; the existence, location or scale of symbols or other elements of graphics - the internal structure of data, including layers and data attributes; and the style or weight of lines. **Thomas Brown Architects Inc.** makes no representations as to the usability of this CAD data on any system.
7. Users of this computer data are advised to review all current versions, as well as subsequent versions, of project documentation for inconsistencies and revisions. It is the responsibility of the user to identify and make all required revisions or corrections to this data. **Thomas Brown Architects Inc.** will not issue updates to CAD data.
8. **Thomas Brown Architects Inc.** reserves the right to remove all indications of its ownership and/or involvement from each electronic file.
9. The User agrees not to modify or alter the electronic documents in any way.
10. The User agrees not to use or reuse the electronic documents in any manner except as expressly permitted by this agreement.
11. By acceptance of this electronic media and the files it contains, the user agrees, to the fullest extent of the law, to indemnify and hold **Thomas Brown Architects Inc.** harmless from any damage, cost or liability, including but not limited to reasonable attorney's fees and cost of defense, arising from any changes made to these files by anyone other than **Thomas Brown Architects Inc.** or from reuse of files and data without the prior written consent of **Thomas Brown Architects Inc.**
12. While reasonable care has been used to ensure that the transfer medium and the material are free of computer viruses, **Thomas Brown Architects Inc.** accepts no responsibility for any loss or damage that might result from the transmission of computer viruses in this process.
13. **Thomas Brown Architects Inc.** believes that no licensing or copyright fees due to others on account of the release of electronic files, but to the extent that any are, the user of the files will pay the appropriate fees and hold **Thomas Brown Architects Inc.** harmless for such claims.
14. If shop drawings are issued by the *Contractor* which appears to have made unaltered use of the CAD files issued by **Thomas Brown Architects Inc.**, they will be returned without review. Under no circumstances can it be assumed that **Thomas Brown Architects Inc.** working drawings are sufficiently detailed to become documents for final manufacturing - in other words, shop drawings.
15. The terms of this disclaimer are effective immediately upon the User's receipt of digital information.

[illegible]

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## **PART 1 - GENERAL**

### **1.1 GENERAL REQUIREMENTS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.2 SECTION INCLUDES

1.3 CASH ALLOWANCES

PART 2- PRODUCTS

PART 3 - EXECUTION

### **1.3 CASH ALLOWANCES**

- .1 The *Contract Price* includes the Cash Allowances stated below.
- .2 Expenditures from Cash Allowance Stipulated Sum shall be directed by *Consultant* in writing through a Cash Allowance Authorization Form.
- .3 Unexpended amounts of cash allowances shall be deducted from the *Contract Price* at completion of *Work*.
- .4 Cash allowances cover the net cost to the *Contractor* of services, products, construction machinery and equipment, freight, unloading, handling, storage, installation, and other authorized expenses incurred in performing the *Work* stipulated under the cash allowances.
- .5 Cash allowances do not include the *Value Added Taxes* payable by the *Owner* to the *Contractor*.
- .6 Where cash allowances are noted for purchase only, the cost for storage at the *Place of the Work* and installation shall be part of the responsibility of the *Contractor* and is not included in the cash allowance. Storage at the *Place of the Work* and installation shall be in accordance with the manufacturer's instructions.
- .7 The *Contractor* is responsible for coordination of parts of the *Work* to be paid for by Cash Allowance with the remainder of the *Work*, including shop drawings and other submittals, in the same manner as with other *Subcontractors*.
- .8 The *Contract Price*, and not the cash allowances, includes the *Contractor's* overhead and profit in connection with such cash allowances.
- .9 The value of *Work* performed under a Cash Allowance is eligible to be included in progress payments. Copies of invoices pertaining to expenditures against the Cash Allowance shall be appended to applications for progress payments.
- .10 The *Contractor* shall prepare a schedule for the ordering of items called for under the cash allowances to avoid delaying the progress of the *Work*. Schedule shall be in accordance with Section 01 33 00.
- .11 The *Contractor* is required to notify the *Consultant* in writing at such time as when 75% of the total Cash Allowance stipulated price has been expended.

.12 *Consultant* may direct *Contractor* to obtain bids, at no additional cost to the *Owner*, for *Work* for which payment is made from cash allowances.

.13 The total amount of the Cash Allowance shall be advised and will cover the following:

- .1 Inspection and Testing Services. The *Contractor* shall obtain a minimum of 3 quotes and *Provide* to the *Consultant* and the *Owner* for review prior to issuance of Cash Allowance Authorization.
- .2 Hydro Connection.
- .3 Water Connection.
- .4 Supply and Installation of Gas Meter Assembly Connection.
- .5 Soil Remediation.
- .6 Supply and Installation of Exterior Digital Sign Pylon and Pinmounted.
- .7 Fire Alarm Monitoring System
- .8 EASR for Generator
- .9 Appliances
- .10 CCTV and Security systems.

**Fire Station specific:**

- .11 Bunker Gear Racks
- .12 Bunker Gear Washer and Dryer.
- .13 PA System.
- .14 Supply and Installation of Vehicle Exhaust Extraction Systems (Apparatus Bays)

**PART 2- PRODUCTS**

Not applicable.

**PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 - GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 DEFINITION OF "OR EQUIVALENT"
- 1.4 *PRODUCT* SUBSTITUTION PROCEDURES

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

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

### **1.3 DEFINITION OF "OR EQUIVALENT"**

- .1 *Acceptable Products, or Products lists* which include the phrase "or equivalent", shall be interpreted to mean that a 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*. The *Contractor* shall be responsible for all 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 product substitutions.
- .3 Confirm delivery of specified items prior to proposing alternates or equals.

### **1.4 *PRODUCT* SUBSTITUTION PROCEDURES**

- .1 Base the *Work* of this *Contract* and the *Contract Price* upon using the new materials and *Products* specified.
- .2 Where materials and *Products* are specified only by reference to standards, *Provide* any material or *Product* that meets the standard.
- .3 Materials and *Products* specified by their proprietary names or catalogue number shall form the basis for the *Work*. No substitutes for these may be used without the *Consultant's* prior written authorization which may be obtained in accordance with requirements of this Section.
- .4 Where a material or *Product* is specified by naming two or more acceptable materials or proprietary *Products*, *Provide* any one of the specified materials or *Products*. If compliance with a referenced standard is also specified, the material or *Product* selected shall meet the standard.
- .5 Substitutions will be considered only when submitted in sufficient time to permit proper investigation by the *Consultant*, and under the conditions specified herein.
- .6 Requests for substitution may only be considered if submitted within 30 Days after *Contract* award. Requests for substitutions submitted after 30 Days after the *Contract* award may not be considered.

- .7 There is no obligation on the part of the *Consultant* or the *Owner* to accept any proposed substitutions that, in the *Consultant's* or the *Owner's* opinion, acting reasonably, do not meet the requirements of the *Contract Documents*, including this Section.
- .8 Substitutions proposed may be considered only under the following conditions:
  - .1 If the proposed substitute materials and Products, having been brought to the attention of, and considered by, the *Consultant* as equivalent to those specified, will decrease the *Contract Price*.
  - .2 If the proposed substitute materials and Products, having been brought to the attention of, and considered by, the *Consultant* as equivalent to those specified, will not increase the *Contract Price* but will decrease the *Contract Time*.
  - .3 If a material or *Product* is specified together with a requirement for performance and it can be shown by the *Contractor* that the specified material or *Product* will not achieve the specified performance.
  - .4 When a substitution is otherwise advantageous to the *Owner* or to the execution of the *Work* as determined by the *Consultant*.
- .9 When proposing substitutions, the *Contractor* shall submit with each application, the material and *Product* names and complete specifications substantiating compliance of the proposed substitution with the requirements of the *Contract Documents*, including:
  - .1 *Product* Identification.
  - .2 Detailed, item by item comparison between the properties and characteristics of the specified material or *Product*, and the proposed substitution.
  - .3 Manufacturer's name, address, and telephone number.
  - .4 Manufacturer's material or *Product* literature.
  - .5 Performance, technical and test data.
  - .6 Reference standards.
  - .7 *Product* limitations.
  - .8 Samples.
  - .9 List of existing installations.
  - .10 Changes to the *Contract Time*, if any.
  - .11 Changes to the *Contract Price* if any.
- .10 In making a request for substitution, the *Contractor* represents that:
  - .1 The *Contractor* has personally investigated the proposed *Product* or method, and has determined that it is equal or superior in all respects to that specified.
  - .2 The *Contractor* will *Provide* the same guarantee for the substituted *Product* or method as for the *Product* or method specified or indicated;
  - .3 The *Contractor* will coordinate the installation of an accepted substitution into the *Work*, making such changes as may be required for the *Work* to be complete in all respects;
  - .4 The *Contractor* waives all claims for additional costs related to the substitution; and,



- .5 The cost data provided by the *Contractor* as part of the *Contractor's* substitution proposal is complete and includes all related costs including, but not limited to;
- .6 Coordination and supervision;
- .7 Installation and independent inspection and testing;
- .8 Any change in the cost of other affected areas; and,
- .9 Costs for any detailed design or related engineering work.
- .11 Should the proposed substitution be accepted, either in part or in whole, the *Contractor* assumes full responsibility when the substitution affects any other part of the *Work*.
- .12 The *Contractor* shall ensure that substitutions are accommodated by space allotted for the specified materials, Products, methods or processes.
- .13 The cost of changes in the work of all Specification Sections necessitated by the use of proposed substitutions will not be considered or approved as a change in the *Work* and no increase in the *Contract Time* will be considered or approved.
- .14 Substitutions that have not been accepted through the process described in this section and are shown on shop drawings, will be rejected, whether or not the shop drawings have been reviewed.
- .15 Credits arising from accepted substitutions will be credited to the *Contract Price* by way of a *Change Order* in accordance with Section 01 26 00.
- .16 No substitutions will be permitted without prior written recommendation by the *Consultant* and prior written approval by the *Owner*, acting reasonably.
- .17 *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**

**From:** \_\_\_\_\_ **RFS No:** \_\_\_\_\_  
**To:** \_\_\_\_\_ (RFS No. To be completed by Consultant)  
**Copies:** \_\_\_\_\_ **Issue Date:** \_\_\_\_\_

**Product, Material or Equipment Required of the Contract Documents:**

Specification Section: \_\_\_\_\_ Drawing No./Detail: \_\_\_\_\_  
Description: \_\_\_\_\_

**Requested Substitute Product, Material or Equipment:**

Description: \_\_\_\_\_

Attachments Included: ☐ Drawings ☐ Product Data ☐ Samples ☐ Test Reports  
☐ Other: \_\_\_\_\_

Reason for Substitution: \_\_\_\_\_

Expected Lifespan: \_\_\_\_\_ Warranty Duration \_\_\_\_\_

Maintenance Regime: \_\_\_\_\_

Has this item been used in a similar application? ☐ Yes ☐ No

Describe Application: \_\_\_\_\_  
\_\_\_\_\_

Describe Results: \_\_\_\_\_  
\_\_\_\_\_

Owner Contact and Location: \_\_\_\_\_  
\_\_\_\_\_

**Comparisons of the Specified Item and the Proposed Substitution:**

Compare significant qualities of size, weight, durability, performance and visual effect:

Describe any changes required in other elements of the Work to accommodate the proposed substitution, including work performed by the Owner and separate contractors:

What effect will the proposed substitution have on the work schedule in comparison to the work schedule without approval of the proposed substitution?

---

Cost comparison of the proposed substitution to the originally specified item, including correlating modifications required to other work:

---

Net cost to the Owner: \_\_\_\_\_

Changes in contract time: \_\_\_\_\_

**Signatures:**

Permission to make any substitution after award of contract shall be effected by Change Order. It shall not relieve the Contractor, any subcontractor, or manufacturer, fabricator, or supplier from the responsibility for any deficiency that may exist in the substituted product or any departures or deviations from the Contract Documents as modified by such Change Order.

Except as otherwise expressly specified by the Contractor in the Request for Substitution and expressly approved in such Change Order, the Contractor shall be deemed to warrant, by his request, that the proposed substitute will satisfy all standards and requirements satisfied by the original product, material or equipment specified and the Change Order shall not be deemed to modify the Contract Documents with respect thereto.

If any substitution will affect a correlated function, adjacent construction, or the work of other trades or contractors, the necessary changes and modifications to the affected work shall be considered as an essential part of the proposed substitution, to be accomplished by the Contractor without additional time or expense to the Owner if and when accepted.

Contractor's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Consultants' Action:**

Consultant's Name: \_\_\_\_\_

Consultant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

☐ Accepted ☐ Rejected ☐ More information required.

Comments: \_\_\_\_\_  
\_\_\_\_\_

Consultant's Name: \_\_\_\_\_

Consultant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

☐ Accepted ☐ Rejected ☐ More information required.

Comments: \_\_\_\_\_  
\_\_\_\_\_

Consultant's Name: \_\_\_\_\_

Consultant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

☐ Accepted ☐ Rejected ☐ More information required.

Comments: \_\_\_\_\_  
\_\_\_\_\_

Consultant's Name: \_\_\_\_\_

Consultant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

☐ Accepted ☐ Rejected ☐ More information required.

Comments: \_\_\_\_\_  
\_\_\_\_\_

Consultant's Name: \_\_\_\_\_

Consultant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

☐ Accepted ☐ Rejected ☐ More information required.

Comments: \_\_\_\_\_  
\_\_\_\_\_

**End of Section**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 - GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 RELATED SECTIONS
- 1.4 CHANGES
- 1.5 CHANGE ORDER
- 1.6 VALUATION OF CHANGES AND *CONTRACTOR'S* MARK-UP
- 1.7 DELAYS
- 1.8 REQUEST FOR INTERPRETATION – RFI

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

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

### **1.3 RELATED SECTIONS**

- .1 Section 01 21 00 Allowances
- .2 Section 01 25 00 *Product* Substitution Procedures

### **1.4 CHANGES**

- .1 Refer to GC 14 of the General Conditions of the Contract.
- .2 The *Owner*, through the *Consultant*, without invalidating the *Contract*, may make changes in the *Work* consisting of additions, deletions, or other revisions to the *Work* by *Change Order* or a *Change Directive*.
- .3 The *Contractor* shall not perform a change in the *Work* without a *Change Order* or a *Change Directive*.
- .4 The Consultant will prepare and issue Notices of Change, Change Orders, and Change Directives.
- .5 Communication and correspondence related to all changes shall, at all times, be through the *Consultant*.

### **1.5 CHANGE ORDER**

- .1 Refer to GC 15 of the General Conditions of the Contract.
- .2 When a change in the *Work* is proposed by the *Owner* or the *Consultant* or required by conditions at the *Place of the Work* or *Authorities Having Jurisdiction*, the *Consultant* shall *Provide* a notice describing the proposed change in the *Work* to the *Contractor*, to be known as a *Notice of Change*.

- .3 Changes in the *Work* proposed by the *Contractor* shall be in accordance with Section 01 25 00. Proposed changes not in accordance with the requirements of Section 01 25 00 shall not be considered.
- .4 Upon receipt of a *Notice of Change* from the *Consultant*, the *Contractor* shall present, in a form acceptable to the *Consultant* and within ten (10) *Working Days* of the date on the *Notice of Change*, a method of adjustment or an amount of adjustment for the *Contract Price*, if any, and the adjustment in the *Contract Time*, if any, for the proposed change in the *Work*.
- .5 *Contractor* shall number their pricing quotes in one sequence in order submitted to *Consultant*.
- .6 When the *Owner* and the *Contractor* agree to the adjustments in the *Contract Price* and *Contract Time*, or to the method to be used to determine the adjustments, such agreement shall be effective immediately and shall be recorded in a *Change Order*, signed by the *Owner* and the *Contractor*. The value of the *Work* performed as the result of a *Change Order* shall be included in applications for progress payment as expenditures.

## 1.6 VALUATION OF CHANGES AND CONTRACTOR'S MARK-UP

- .1 Valuation and the *Contractor's* mark-up for overhead and profit for changes in the *Work* shall be calculated in accordance with the provisions of the General Conditions.

## 1.7 DELAYS

- .1 Refer to GC 4 of the General Conditions of the Contract.

## 1.8 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*.
  - .1 An RFI shall not constitute notice of claim for a delay or extra to the *Contract Price*.
- .2 Submittal procedures:
  - .1 RFI form:
    - .1 Submit RFI on "Request for Interpretation" form as approved by the *Consultant*. 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. The *Consultant* shall not respond to an RFI where necessary information is missing, insufficient, unclear, or ambiguous.
  - .2 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 meeting for coordination.
  - .3 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*.
  - .4 RFIs shall be submitted only to the *Consultant* and copied to the *Owner*.

- .5 RFIs shall be submitted only by the *Contractor*. RFIs submitted by *Subcontractors* or *Suppliers* shall not be accepted.
- .6 Number RFIs consecutively in one sequence in order submitted.
- .7 Submit one distinct RFI per RFI form.
- .8 The *Consultant* shall review RFIs from the *Contractor* submitted in accordance with this section, with the following understandings:
  - .1 The *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.
- .9 Allow 10 *Working Days* for review of each RFI by the *Consultant*.
  - .1 The *Consultant's* review of RFI commences on date of receipt by the *Consultant* of RFI submittal and extends to date RFI returned by the *Consultant*.
  - .2 When the RFI submittal is received by the *Consultant* before noon, review period commences that *Day*; when RFI submittal is received by the *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 10 *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*.
  - .4 When RFI submittal shall be reviewed by one or more of *Consultant's* subconsultants, increase the review period by 5 *Working Days* for each separate subconsultant.
- .10 *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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SCHEDULE OF VALUES
- 1.4 FORM OF SUBMITTAL
- 1.5 REVIEW AND RE-SUBMITTAL
- 1.6 SAMPLE - SCHEDULE OF VALUES FORM

### **1.3 SCHEDULE OF VALUES**

- .1 Submit a Schedule of Values to the *Consultant* at least 10 days prior to submitting first Application for Payment. Refer to attached sample Schedule of Values for required breakdowns in each Division.
  - .1 For item 01 77 00, *Project Manuals*, *Warranties* and *As Built Drawings*, the *Contractor* is required to carry a value 2% of the *Contract Price* in accordance with section 01 77 00.
  - .2 Division 1 – General Conditions shall be broken down as provided in the example below. Lump Sum Values will not be accepted and will not be used for contract modifications or Delays.
- .2 Upon request by *Consultant*, support values given with data that will substantiate their correctness.
- .3 Submit quantities of designated materials.
- .4 Refer to the General Conditions of the contract for details of payment procedure.
- .5 Schedule of Values will be used only as basis for *Contractor's* Application for payment.

### **1.4 FORM OF SUBMITTAL**

- .1 Submit Schedule of Values on 8½" x 11" white paper, in accordance with sample schedule included in this Section at the end of each month.
- .2 With the submission of the initial Schedule of Values, *Contractor* shall submit an initial Cash Flow Projection for the project. With each Application for Payment, *Contractor* shall submit an updated Cash Flow projection.

### **1.5 REVIEW AND RE-SUBMITTAL**

- .1 After review by *Consultant*, revise and resubmit Schedule (and Working Schedule of Material Values), as required.



.2 Resubmit revised schedule in same manner.

#### **1.6 SAMPLE - SCHEDULE OF VALUES FORM**

.1 See following four (4) pages.

Client:	Client Name										Document 01 29 73		
Project Name:	Project Name												
Project Number:	####												
Consultant:	Thomas Brown Architects Inc.												
Contractor:	Name of Contractor												
										Application for Payment #:		N/A	
										Issue Date:		September 23, 2020	
										For Period Ending:		TBD	
Spec. Section	Item	Contract	% to Date	Previous Amount	Amount This Draw	Completed to Date	Balance to Complete						
Division 1 General Conditions													
00 61 00	Bonding	\$	-	0.0%	\$	-	\$	-	\$	-	\$		
00 73 16	Insurance	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 30 00	General Site Administration	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 30 00	General Project Administration	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 31 00	Mobilization	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 31 00	Demobilization	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 50 00	Temporary Power	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 31 00	Site Office Trailer / Setup	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 31 00	Temporary Fencing / Silt Fence Maintenance	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 50 00	Preliminary Survey	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 50 00	Locates	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 31 00	Final Cleanup	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 77 00	Project Closeout Manuals/Documentation	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 77 00	Project Closeout As-Builts	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
01 91 00	Commissioning & Training	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
Division 1 General Conditions subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-	\$		
Division 2 Site Improvements													
02 27 00	Erosion & Sediment Control	\$	-	0.0%	\$	-	\$	-	\$	-	\$		
02 27 10	Mud Mat	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
04 40 20	Armourstone	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
	Gravel Beds	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
	Municipal Signage	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
31 05 17	Aggregates	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
31 23 10	Excavation	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
31 23 10	Backfill	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 01 90	Tree Protection	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 11 19	Granular Sub-base	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 11 23	Granular Base	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 12 16	Asphalt Paving	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 13 13	Concrete Curbs, Sidewalks, Pads	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
	Concrete Apron Slab	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
	Concrete Apron Slab - Reinforcing	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 14 13.19	Precast Concrete Unit Paving	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 17 23	Traffic Markings	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 31 13	Chain Link Fence	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 33 00	Site Furnishings	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 91 19.13	Topsoil Placement and Grading	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 92 23	Sodding	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
32 93 00	Trees, Shrubs, plants	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
33 05 00	Manholes and Catchbasins	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
33 10 00	Site Services - Water System	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
33 10 00	Site Services - Water System - Chlorination of System	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
33 30 00	Site Services - Sanitary Sewers	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
33 40 00	Site Services - Storm Sewers	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
33 44 16	Precast Trench Drain Systems Material	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
33 44 16	Precast Trench Drain Systems Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
Division 2 Site Improvements subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-	\$		
Division 3 Concrete													
03 10 00	Concrete Formwork - Foundation and Footings	\$	-	0.0%	\$	-	\$	-	\$	-	\$		
03 20 00	Concrete Reinforcing Install - Foundation and Footings	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 20 00	Concrete Reinforcing Supply - Foundation and Footings	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 20 0	Concrete Reinforcing Install - Slab on Grade	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 20 00	Concrete Reinforcing Supply - Slab on Grade	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 30 53	Cast in Place Concrete Supply - Foundation and Footings	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 30 53	Cast in Place Concrete Supply - Slab on Grade	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 41 13	Precast Concrete Hollow Core Planks	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 45 00	Architectural Precast Concrete Cladding	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 50 00	Concrete Sealer	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
03 50 00	Concrete Finishing	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
Division 3 Concrete subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-	\$		
Division 4 Masonry													
04 21 00	Brick Masonry Install	\$	-	0.0%	\$	-	\$	-	\$	-	\$		
04 21 00	AVB & Insulation	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
04 22 00	Concrete Block Masonry Interior	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
04 22 00	Concrete Block Masonry Exterior	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
Division 4 Masonry subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-	\$		
Division 5 Metals													
05 21 19	Structural Steel Supply	\$	-	0.0%	\$	-	\$	-	\$	-	\$		
05 21 19	Structural Steel Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 21 19	OWSJ Supply	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 21 19	OWSJ Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 31 00	Steel Roof Decking Material	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 31 00	Steel Roof Decking Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 31 00	Steel Floor Decking Material	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 31 00	Steel Floor Decking Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 31 00	Roof Ladder and Guard Rails	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 41 00	Cold-Formed Metal Structural Stud - Material	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 41 00	Cold-Formed Metal Structural Stud - Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 50 00	Metal Fabrications / Miscellaneous Material	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 50 00	Metal Fabrications / Miscellaneous Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 50 01	Bollard Covers	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 73 10	Glass Railing Systems - Material	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
05 73 10	Glass Railing Systems - Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
Division 5 Metals subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-	\$		
Division 6 Woods, Plastics													
06 10 10	Rough Carpentry / Blocking	\$	-	0.0%	\$	-	\$	-	\$	-	\$		
60 20 00	Architectural Wood Work Fabrication & Material	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
60 20 00	Architectural Wood Work Labour	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
60 20 00	Countertop / Solid Surface Sills	\$	0.0%	\$	-	\$	-	\$	-	\$	-		
Division 6 Woods, Plastics subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-	\$		

Division 7 Thermal & Moisture Protection										
07 13 26	Sheet Waterproofing	\$	-	0.0%	\$	-	\$	-	\$	-
07 21 00	Cavity Wall Thermal Insulation	\$	-	0.0%	\$	-	\$	-	\$	-
07 21 00	Below Grade Thermal Insulation - Slab & Foundation Wall	\$	-	0.0%	\$	-	\$	-	\$	-
07 26 13	Above Grade Vapour Barrier	\$	-	0.0%	\$	-	\$	-	\$	-
07 26 16	Below Grade Vapour Barrier	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 16	Aluminum Panel Cladding - Panel Material	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 16	Aluminum Panel Cladding - Panel Labour	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 16	Aluminum Panel Cladding - Insulation Material	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 16	Aluminum Panel Cladding - Insulation Labour	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 16	Aluminum Plate Cladding - Panel Material	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 16	Aluminum Plate Cladding - Panel Labour	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 16	Aluminum Plate Cladding - Insulation Material	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 16	Aluminum Plate Cladding - Insulation Labour	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 19	Metal Cladding System - Soffit Material	\$	-	0.0%	\$	-	\$	-	\$	-
07 46 19	Metal Cladding System - Soffit Labour	\$	-	0.0%	\$	-	\$	-	\$	-
07 52 16	SBS Modified Bituminous Membrane Roofing	\$	-	0.0%	\$	-	\$	-	\$	-
07 52 16	SBS Modified Bituminous Membrane Roofing - Insulation	\$	-	0.0%	\$	-	\$	-	\$	-
07 52 16	Roofing Pavers	\$	-	0.0%	\$	-	\$	-	\$	-
07 62 00	Metal Flashing	\$	-	0.0%	\$	-	\$	-	\$	-
07 62 00	Roof Anchor Line	\$	-	0.0%	\$	-	\$	-	\$	-
07 81 00	Sprayed Fire-Resistive Materials (SFRM)	\$	-	0.0%	\$	-	\$	-	\$	-
07 84 00	Firestopping and Smoke Seals	\$	-	0.0%	\$	-	\$	-	\$	-
07 92 00	Joint Sealants	\$	-	0.0%	\$	-	\$	-	\$	-
Division 7 Thermal & Moisture Protection subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 8 Openings										
08 11 13	Steel Doors and Frames - Supply	\$	-	0.0%	\$	-	\$	-	\$	-
08 11 13	Steel Doors and Frames - Install	\$	-	0.0%	\$	-	\$	-	\$	-
08 33 00	Rolling Grilles	\$	-	0.0%	\$	-	\$	-	\$	-
08 33 30	Rolling Fire Doors	\$	-	0.0%	\$	-	\$	-	\$	-
08 35 13	Four Fold Metal Doors	\$	-	0.0%	\$	-	\$	-	\$	-
08 36 13	Sectional Overhead Metal Doors	\$	-	0.0%	\$	-	\$	-	\$	-
08 41 00	Aluminum Framed Glazing Systems c/w Glass	\$	-	0.0%	\$	-	\$	-	\$	-
08 71 00	Door Hardware - Material	\$	-	0.0%	\$	-	\$	-	\$	-
08 71 00	Door Hardware - Install	\$	-	0.0%	\$	-	\$	-	\$	-
08 91 19	Architectural Louvers	\$	-	0.0%	\$	-	\$	-	\$	-
Division 8 Openings subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 9 Finishes										
09 29 00	Drywall & Framing	\$	-	0.0%	\$	-	\$	-	\$	-
09 31 00	Tiling - Floor	\$	-	0.0%	\$	-	\$	-	\$	-
09 31 00	Tiling - Wall	\$	-	0.0%	\$	-	\$	-	\$	-
09 21 16	Acoustical Tile Ceiling Systems	\$	-	0.0%	\$	-	\$	-	\$	-
09 65 13	Rubber Base	\$	-	0.0%	\$	-	\$	-	\$	-
09 65 20	Rubber Tile Flooring	\$	-	0.0%	\$	-	\$	-	\$	-
09 68 13	Carpet Tile	\$	-	0.0%	\$	-	\$	-	\$	-
09 91 00	Painting	\$	-	0.0%	\$	-	\$	-	\$	-
Division 9 Finishes subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 10 Specialties										
10 11 00	Visual Display Surfaces	\$	-	0.0%	\$	-	\$	-	\$	-
10 14 00	Interior Signage	\$	-	0.0%	\$	-	\$	-	\$	-
10 21 13	Washroom Partitions	\$	-	0.0%	\$	-	\$	-	\$	-
10 26 13	Corner Guards	\$	-	0.0%	\$	-	\$	-	\$	-
10 28 10	Washroom Accessories & Janitor Accessories	\$	-	0.0%	\$	-	\$	-	\$	-
10 50 30	Turnout Gear Lockers - Wall Mounted	\$	-	0.0%	\$	-	\$	-	\$	-
10 51 13	Prefinished Metal Lockers	\$	-	0.0%	\$	-	\$	-	\$	-
10 51 13	Exterior Signage	\$	-	0.0%	\$	-	\$	-	\$	-
10 51 13	Traffic Signage	\$	-	0.0%	\$	-	\$	-	\$	-
10 51 13	Metal Shelving	\$	-	0.0%	\$	-	\$	-	\$	-
10 75 13	Flagpoles	\$	-	0.0%	\$	-	\$	-	\$	-
Division 10 Specialties subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 11 Equipment										
11 52 13	Projection Screens	\$	-	0.0%	\$	-	\$	-	\$	-
Division 11 Equipment subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 12 Furnishings Equipment										
12 24 16	Roller Window Shades	\$	-	0.0%	\$	-	\$	-	\$	-
12 48 16	Entrance Floor Grilles	\$	-	0.0%	\$	-	\$	-	\$	-
12 58 29.14	Murphy Bed Mattresses	\$	-	0.0%	\$	-	\$	-	\$	-
Division 12 Furnishings subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 14 Conveying Equipment										
14 21 00	Electric Traction Elevators	\$	-	0.0%	\$	-	\$	-	\$	-
Division 14 Conveying Equipment subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 1 General Conditions subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 2. Site Improvements subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 3 - 14 Architectural / Structural		\$	-	0.0%	\$	-	\$	-	\$	-
MECHANICAL SYSTEMS										
Division 21 Fire-Suppression System										
21 00 00	Sprinkler System	\$	-	0.0%	\$	-	\$	-	\$	-
	Fire Extinguishers	\$	-	0.0%	\$	-	\$	-	\$	-
	Manuals/Documentation/As-builts	\$	-	0.0%	\$	-	\$	-	\$	-
Division 21 Fire-Suppression System subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 22 Plumbing										
22 00 00	Plumbing Piping Materials - Below Ground	\$	-	0.0%	\$	-	\$	-	\$	-
	Plumbing Piping Materials - Above Ground	\$	-	0.0%	\$	-	\$	-	\$	-
	Plumbing Piping Labour - A & B	\$	-	0.0%	\$	-	\$	-	\$	-
	Plumbing Fixtures & Accessories Material	\$	-	0.0%	\$	-	\$	-	\$	-
	Plumbing Fixtures & Accessories Labour	\$	-	0.0%	\$	-	\$	-	\$	-
	Plumbing - HWT, EXP, Boilers Material	\$	-	0.0%	\$	-	\$	-	\$	-
	Plumbing - HWT, EXP, Boilers Labour	\$	-	0.0%	\$	-	\$	-	\$	-
	Seismic Restraints	\$	-	0.0%	\$	-	\$	-	\$	-
Division 22 Plumbing subtotal:		\$	-	0.0%	\$	-	\$	-	\$	-
Division 23 Heating, Ventilating, and Air Conditioning (HVAC)										
23 00 00	Vehicle Exhaust Extraction Systems	\$	-	0.0%	\$	-	\$	-	\$	-
	Mechanical Equipment Supply (FC, RTU, Split S, ERV)	\$	-	0.0%	\$	-	\$	-	\$	-
	Mechanical Equipment Install (FC, RTU, Split S, ERV)	\$	-	0.0%	\$	-	\$	-	\$	-
	Mechanical Equipment Supply (IRH)	\$	-	0.0%	\$	-	\$	-	\$	-

Mechanical Equipment Install (IRH)	\$	-	\$	-	\$	-	\$	-	\$
Gas Piping Material	\$	-	\$	-	\$	-	\$	-	\$
Gas Piping Labour	\$	-	\$	-	\$	-	\$	-	\$
Duct Work - Sheet Metal Material	\$	-	\$	-	\$	-	\$	-	\$
Duct Work - Sheet Metal Labour	\$	-	\$	-	\$	-	\$	-	\$
Refrigeration Piping	\$	-	\$	-	\$	-	\$	-	\$
Insulation Material	\$	-	\$	-	\$	-	\$	-	\$
Insulation Labour	\$	-	\$	-	\$	-	\$	-	\$
Packaged Exhaust Fans	\$	-	\$	-	\$	-	\$	-	\$
Grilles, Diffusers, and Registers	\$	-	\$	-	\$	-	\$	-	\$
Seismic Restraints	\$	-	\$	-	\$	-	\$	-	\$
Division 23 Heating, Ventilating, and Air Conditioning subtotal:	\$	-	\$	-	\$	-	\$	-	\$
	0.0%								
Division 25 Integrated Automation									
25 00 00 Building Automation Controls Materials	\$	-	\$	-	\$	-	\$	-	\$
Building Automation Control Install	\$	-	\$	-	\$	-	\$	-	\$
Building Automation Training	\$	-	\$	-	\$	-	\$	-	\$
Division 25 Integrated Automation subtotal:	\$	-	\$	-	\$	-	\$	-	\$
Division 22, 23, 35 General Requirements									
Mobilization	\$	-	\$	-	\$	-	\$	-	\$
Manuals/Documentation/As-builts	\$	-	\$	-	\$	-	\$	-	\$
Testing, Adjusting, and Balancing	\$	-	\$	-	\$	-	\$	-	\$
Division 22, 23, 35 General Requirements subtotal:	\$	-	\$	-	\$	-	\$	-	\$
	0.0%								
Divisions 21, 22, 23, 25 Mechanical subtotal:									
	\$	-	\$	-	\$	-	\$	-	\$
Division 26/27/28 Electrical									
Mobilization and ESA Notifications	\$	-	\$	-	\$	-	\$	-	\$
ESA Inspections	\$	-	\$	-	\$	-	\$	-	\$
Duct Bank - Material	\$	-	\$	-	\$	-	\$	-	\$
Duct Bank - Labour	\$	-	\$	-	\$	-	\$	-	\$
Metering - Material	\$	-	\$	-	\$	-	\$	-	\$
Metering - Install	\$	-	\$	-	\$	-	\$	-	\$
Generator - Material	\$	-	\$	-	\$	-	\$	-	\$
Generator - Labour	\$	-	\$	-	\$	-	\$	-	\$
Exterior Light Fixtures - Material	\$	-	\$	-	\$	-	\$	-	\$
Exterior Light Fixtures - Labour	\$	-	\$	-	\$	-	\$	-	\$
Interior Light Fixtures - Material	\$	-	\$	-	\$	-	\$	-	\$
Interior Light Fixtures - Labour	\$	-	\$	-	\$	-	\$	-	\$
Device Rough-in - Material	\$	-	\$	-	\$	-	\$	-	\$
Device Rough-in - Labour	\$	-	\$	-	\$	-	\$	-	\$
Branch Conduit - Material	\$	-	\$	-	\$	-	\$	-	\$
Branch Conduit - Labour	\$	-	\$	-	\$	-	\$	-	\$
Branch Wiring - Material	\$	-	\$	-	\$	-	\$	-	\$
Branch Wiring - Labour	\$	-	\$	-	\$	-	\$	-	\$
Distribution Equipment - Material	\$	-	\$	-	\$	-	\$	-	\$
Distribution Equipment - Labour	\$	-	\$	-	\$	-	\$	-	\$
Fire Alarm - Material	\$	-	\$	-	\$	-	\$	-	\$
Fire Alarm - Labour	\$	-	\$	-	\$	-	\$	-	\$
Testing, Adjusting, and Commissioning	\$	-	\$	-	\$	-	\$	-	\$
Manuals/Documentation/As-builts	\$	-	\$	-	\$	-	\$	-	\$
Division 26/27/28 Electrical subtotal:	\$	-	\$	-	\$	-	\$	-	\$
	0.0%								
Divisions 26, 27, 28 Electrical subtotal:									
	-	0.0%	-	-	-	-	-	-	\$
Cash Allowances:									
1 Inspection and Testing	\$	-	\$	-	\$	-	\$	-	\$
2 Hydro Connection	\$	-	\$	-	\$	-	\$	-	\$
3 Supply and Install of Structured	\$	-	\$	-	\$	-	\$	-	\$
4 Gas Meter assembly Connection	\$	-	\$	-	\$	-	\$	-	\$
5 Exterior Building Signage	\$	-	\$	-	\$	-	\$	-	\$
6 Interior Building Signage	\$	-	\$	-	\$	-	\$	-	\$
7 Soil Remediation	\$	-	\$	-	\$	-	\$	-	\$
8	\$	-	\$	-	\$	-	\$	-	\$
9	\$	-	\$	-	\$	-	\$	-	\$
10	\$	-	\$	-	\$	-	\$	-	\$
11	\$	-	\$	-	\$	-	\$	-	\$
12	\$	-	\$	-	\$	-	\$	-	\$
Cash Allowance subtotal:	\$	-	\$	-	\$	-	\$	-	\$
	0.0%								
Contract subtotal:	\$	-	\$	-	\$	-	\$	-	\$
	0.0%								
Change Order:									
1 CO title	\$	-	\$	-	\$	-	\$	-	\$
2	\$	-	\$	-	\$	-	\$	-	\$
3	\$	-	\$	-	\$	-	\$	-	\$
4	\$	-	\$	-	\$	-	\$	-	\$
5	\$	-	\$	-	\$	-	\$	-	\$
6	\$	-	\$	-	\$	-	\$	-	\$
7	\$	-	\$	-	\$	-	\$	-	\$
8	\$	-	\$	-	\$	-	\$	-	\$
9	\$	-	\$	-	\$	-	\$	-	\$
10	\$	-	\$	-	\$	-	\$	-	\$
Change Order	\$	-	\$	-	\$	-	\$	-	\$
Contract amount:	\$	-	\$	-	\$	-	\$	-	\$
Issued Change Directives:									
1 CD title	-	0.0%	-	-	-	-	-	-	Approved
2	-	0.0%	-	-	-	-	-	-	
3	-	0.0%	-	-	-	-	-	-	
4	-	0.0%	-	-	-	-	-	-	
5	-	0.0%	-	-	-	-	-	-	
6	-	0.0%	-	-	-	-	-	-	
7	-	0.0%	-	-	-	-	-	-	
8	-	0.0%	-	-	-	-	-	-	
9	-	0.0%	-	-	-	-	-	-	
10	-	0.0%	-	-	-	-	-	-	

Change Directive subtotal: \$

- \$ 0.0% \$ - \$ - \$ -

**Contract** amount: - 0.0% - - -

	Contract Amount	% to Date	Previous Amount	Amount This Draw	Completed to Date	Bal anc
Sub Total	\$ -		\$ -	\$ -	\$ -	#
HST at 13%	-					
Total Contract	-					
Lien on					0%	
Deficiency retainage					-	
Basic holdback of		10.00%			#REF!	
Finishing holdback of		10.00%			#REF!	
Current work less holdbacks					#REF!	
Holdback previously released				-		
Holdback released this issue						-
Total holdback released					-	
Payable to date					#REF!	
Previously payable ( from payable to date on previous certificate)						
Payable this issue					#REF!	
HST payable					#REF!	
Total:					#REF!	
Adjustment to match invoice:					-	
Total payable:					#REF!	

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 GENERAL
- 1.4 IDENTIFICATION OF SYSTEMS
- 1.5 COMMISSIONING AND SYSTEMS DEMONSTRATIONS
- 1.6 SUPERINTENDENCE
- 1.7 DIMENSIONS
- 1.8 COORDINATION
- 1.9 BUILDING DIMENSION, TEMPLATES, BUILT-INS, AND COORDINATION

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

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

### **1.3 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.

### **1.4 IDENTIFICATION OF SYSTEMS**

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

### **1.5 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 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 77 00.

### **1.6 SUPERINTENDENCE**

- .1 The *Contractor* shall *Provide* superintendent and necessary supporting staff personnel who shall be in attendance at the *Place of the Work* while *Work* is being performed, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.
  - .1 The *Contractor* shall *Provide* a qualified superintendent to supervise the *Work* at all times.
- .2 The *Contractor* shall appoint a superintendent at the *Place of the Work* who shall have overall authority at the *Place of the Work* and shall speak for the *Contractor* and represent the

*Contractor's* interest and responsibilities at meetings at the *Place of the Work* and in dealings with the *Consultant* and the *Owner*.

## 1.7 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.

## 1.8 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.

## 1.9 BUILDING DIMENSION, TEMPLATES, BUILT-INS, AND COORDINATION

- .1 Take necessary dimensions for the proper execution of the *Work*. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.
- .2 *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, in accordance with Section 01 33 00.
- .11 *Subcontractors* shall direct related *Subcontractors* on site of specific locations required for sleeves and openings. The *Contractor* shall be responsible for coordinating such activity to ensure no interruption in the progress of the *Work*.
- .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**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### PART 1 – GENERAL

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 ADMINISTRATIVE
- 1.4 CONTRACT START-UP MEETING
- 1.5 PRE-INSTALLATION MEETINGS
- 1.6 PROGRESS MEETINGS
- 1.7 PRE-TAKEOVER MEETING
- 1.8 POST-CONSTRUCTION MEETING
- 1.9 SPECIAL MEETINGS

#### PART 2- PRODUCTS

#### PART 3 - EXECUTION

### **1.3 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 Written notice of each *Site* meeting shall, in general, appear at the conclusion of the minutes of the preceding meeting or, else, shall be issued by the *Consultant*, via memorandum, no less than 24 hours prior to said meeting.
- .2 The *Contractor* shall *Provide* the physical space for the meetings at the *Place of the Work*, generally to be the *Site* office (refer to Section 01 50 00 *Temporary Work* for the complete requirements of the *Site* office).
- .3 The *Consultant* will prepare agendas for meetings specified herein.
  - .1 Agendas shall include, as a minimum, the agenda items specified in the *Contract Documents*.
- .4 The *Consultant* will distribute written notice of each meeting specified herein, complete with meeting agenda, 4 *Working Days* in advance of meeting date to the following, each of who shall be responsible for distributing such notices to other affected parties associated with them (such as, for example, *Subcontractors* in the case of the *Contractor*):
  - .1 The Contractor.
  - .2 The Owner.
- .5 The *Consultant* will chair and record the minutes of meetings specified herein.

- .1 The *Consultant* will distribute copies of minutes to the *Owner*, the *Contractor*, and all others in attendance within 3 *Working Days* after date of meeting.
- .2 Any exceptions taken to, or clarification/correction required of, the various items recorded in the minutes, shall be furnished in writing and copied to all parties listed on the distribution list of the captioned minutes.
- .6 Representatives of parties attending meetings shall be authorized to act on behalf of the parties they represent.
- .7 *Subcontractors* and suppliers shall not attend meetings unless authorized by the *Consultant* and/or the *Owner*.
- .8 The *Contractor* shall prepare, and distribute to the *Consultant* and the *Owner* at each progress meeting date, the following:
  - .1 Monthly progress reports containing updated schedules, shop drawing logs, requests for interpretation logs, submittals and budget.
  - .2 2 Week Lookahead schedules shall be submitted 24hrs before scheduled meeting.

#### 1.4 CONTRACT START-UP MEETING

- .1 Within 10 Days after award of the *Contract*, request a meeting of parties in the *Contract* to discuss and resolve administrative procedures and responsibilities prior to the commencement of the *Work*.
  - .1 The *Consultant* shall chair and minute the *Contract* start-up meeting, and distribute minutes as described above in Section 01 31 19.
- .2 Attendees at *Contract* start-up meeting shall include the following:
  - .1 Contractor.
  - .2 *Contractor's* site superintendent(s).
  - .3 Consultant.
  - .4 Owner.
- .3 Agenda to include the following:
  - .1 General:
    - .1 Welcome and Introduction.
    - .2 *Owner's* guidelines and policies.
  - .3 Communications:
    - .1 Appointment of official representatives of the participants on the *Project*.
    - .2 *Project* contact list.
    - .3 Emergency contact list.
    - .4 Correspondence protocols (email, telephone).
  - .4 Schedule of progress meetings.
  - .5 Status of permits, fees and requirements of the authorities having jurisdiction.

- .6 Status of *Contract* execution.
- .7 Insurance, transcripts of policies.
- .8 Workplace Safety and Insurance Board Certificate.
- .9 *Documents* at the *Place of the Work* (Permit Set, Issued Incorporating Addenda Set / Issued for Construction).
- .2 *Contract* Modifications and Instructions:
  - .1 Requirements for *Contract* Modification and interpretation procedures:
    - .1 Requests for Interpretation.
    - .2 Supplemental Instruction.
    - .3 Notices of Change.
    - .4 Change Directives.
    - .5 Change Orders.
  - .2 Procedures for distribution, approvals, requests for time extension.
- .3 Submittals:
  - .1 Construction schedule.
  - .2 Submittal procedures and schedule of submittals.
  - .3 Requests for Substitutions / Alternates.
  - .4 Delivery of specified equipment and “long-lead” items.
  - .5 *Owner* supplied products (SBO items).
- .4 Schedule of Values, progress claims, administrative procedures and holdbacks.
- .5 Sustainability Requirements: LEED, One Planet Living, other (project specific).
- .6 *Site* Policies and Logistics.
  - .1 *Contractor's* safety procedures.
  - .2 *Site* issues and limitations:
    - .1 Parking.
    - .2 *Site* access, loading and storage.
    - .3 Garbage and construction waste handling.
    - .4 Hazardous substances.
  - .3 *Site* security.
  - .4 Temporary Facilities – signs, offices, storage sheds and utilities.
  - .5 Quality control.
  - .6 Infection prevention and control requirements (healthcare projects only).

- .7 Insect control.
- .7 *Project Close Out:*
  - .1 Take-over procedures, acceptance and warranties.
  - .2 As-built drawings.
  - .3 Operation and Maintenance manuals.
  - .4 *Owner* Training.
  - .5 Substantial Performance of the Work.
  - .6 Total Performance of the Work

## 1.5 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* or as directed by 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 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 the *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 the *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.
- .4 The following shall be in attendance:
  - .1 The Contractor.
  - .2 The *Subcontractors* affected by the work for which the pre-installation meeting is being conducted.
  - .3 The Consultant.
  - .4 Manufacturer's representatives, as applicable.

- .5 Inspection and testing company, as applicable.

## **1.6 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 The Contractor.
  - .2 The *Contractor's Site* superintendent(s).
  - .3 The Consultant.
  - .4 The *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 the *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.
  - .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 the *Contract* modifications and interpretations, including, but not limited to: requests for interpretation and log, *Notices of Change*, *Change Orders*, *Supplemental Instructions*, for effect on construction schedule and on the *Contract Time*.
  - .17 Review of status of as-built documents.
  - .18 Other business.

## **1.7 PRE-TAKEOVER MEETING**

- .1 60 *Working Days* 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, *Notices of Change*, *Change Orders*, *Supplemental Instructions*, for effect on construction schedule and on the *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*.
- .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 the *Contractor's* deficiency list and status.
- .15 Cleaning for occupancy.
- .16 Other business.

## 1.8 POST-CONSTRUCTION MEETING

- .1 Prior to application for completion of the *Contract*, schedule a post-construction meeting. Four Days prior to date for meeting, the *Consultant* will 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 *Notices of Change*, *Change Orders*, and *Supplemental Instructions*.
  - .5 Problems that impede the *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 Handover of the *Contract* completion insurance policy transcripts by the *Contractor*.
- .14 Submission of final application for payment.
- .15 Review and finalize outstanding claims, pricing, and allowance amounts.
- .16 Status of commissioning and training.
- .17 Demobilization and the *Place of the Work* restoration.
- .18 Review of requests for interpretation log.
- .19 Other business.

## 1.9 SPECIAL MEETINGS

- .1 The *Owner* and/or the *Consultant* reserve the right to require special meetings which may be held on short notice and at which attendance by the *Contractor* and representatives of affected *Subcontractors* and suppliers is mandatory. The *Consultant* will 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 INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 GENERAL
- 1.4 LAYOUT AND SURVEY
- 1.5 SUBMITTALS
- 1.6 DRAINAGE
- 1.7 RECORD DRAWINGS
- 1.8 SURVEY REFERENCE POINTS AND LEGAL SURVEY MARKERS
- 1.9 SURVEY LAYOUT
- 1.10 CONSTRUCTION LAYOUT
- 1.11 FIELD ENGINEERING

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

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

### **1.3 GENERAL**

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

### **1.4 LAYOUT AND SURVEY**

- .1 Lines, Levels and Locations for Building:
  - .1 Existing grades, lines and site conditions shown on drawings were taken from survey information established by persons engaged directly by Owner. The accuracy of survey information is not the Consultant's responsibility.
  - .2 The *Contractor* will establish location of property lines. The Contractor shall establish necessary lines, levels and provide batter boards and other means to control the accurate positioning of all building elements.
- .2 Work Adjacent to Public Property:
  - .1 Verify before commencing Work at adjacent public property, that no plans for altering clearances, set-backs, easements, grades, or otherwise have been made by local Authorities Having Jurisdiction, subsequent to their approval of Contract Documents, and which would affect the original intent.



## **1.5 SUBMITTALS**

- .1 Submit qualification data for land surveyor to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- .2 Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- .3 Submit two (2) copies of certified survey signed by registered land surveyor.
- .4 Submit two (2) copies of final property survey showing the Work performed and record survey data.
- .5 Submit a Certificate of Compliance at completion of site grading stating the "As Constructed" grading elevations, and whether or not they differ from design grades.

## **1.6 DRAINAGE**

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

## **1.7 RECORD DRAWINGS**

- .1 Prepare interference and equipment placing drawings to scale to ensure that all components will be properly accommodated within the spaces provided.
- .2 Ensure that clearances required by Authorities Having Jurisdiction and/or for easy maintenance of equipment will be shown on the above drawings.
- .3 Interference drawings shall be prepared before any orders for equipment and/or materials are released to suppliers.

## **1.8 SURVEY REFERENCE POINTS AND LEGAL SURVEY MARKERS**

- .1 Verify existing base horizontal and vertical control points designated on drawings.
- .2 Locate, confirm, and protect control points and legal survey markers prior to starting site work; preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Consultant.
- .4 Report to Consultant when a reference point or legal survey marker is lost or destroyed or requires relocation because of necessary changes in grades or locations.
- .5 Replace control points in accordance with original survey control.
- .6 Replace legal survey markers lost or destroyed as a result of construction activities.

## **1.9 SURVEY LAYOUT**

- .1 Coordinate with Contractor for layout and protection of grade controls.

- .2 Establish permanent benchmark(s) as required, referred to established benchmarks by survey control points, record locations, with horizontal and vertical data.
- .3 Establish lines and levels, locate and layout, by instrumentation.
- .4 Stake for grading, cuts, fills, and slopes.
- .5 Replace grade controls lost or destroyed as a result of construction activities.

#### **1.10 CONSTRUCTION LAYOUT**

- .1 Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify Consultant promptly if discrepancies are discovered.
- .2 Engage a land surveyor to lay out the Work using accepted surveying practices:
  - .1 Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - .2 Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - .3 Inform installers of lines and levels to which they must comply.
  - .4 Check the location, level and plumb, of every major element as the Work progresses.
  - .5 Notify Consultant when deviations from required lines and levels exceed allowable tolerances.
  - .6 Verify accuracy of site dimensions shown on drawings.
  - .7 Verify that present, or known future restrictions, are not violated by construction on the site or lines of traverse to all public utilities.
  - .8 Verify accurately the final underground location on site of all buried storm, sanitary, water and electrical duct banks, when applicable.
  - .9 Close site surveys with an error of closure equal to or less than the standard established by Authorities Having Jurisdiction.
- .3 Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- .4 Maintain a log of layout control Work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Consultant when requested.

#### **1.11 FIELD ENGINEERING**

- .1 Locate existing permanent benchmarks, control points and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations:
  - .1 Do not change or relocate existing benchmarks or control points without prior written approval of Consultant.

- .2 Report lost or destroyed permanent benchmarks or control points promptly.
  - .3 Report the need to relocate permanent benchmarks or control points to Consultant before proceeding.
  - .4 Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
  - .5 Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - .6 Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - .7 Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- .2 Provide as-built site survey information after completion of demolition and excavation operations ready for construction
- .1 Survey grade elevations shall be on a 9 m grid or as required to locate property lines and new building structural grid lines.

## **PART 2 - PRODUCTS**

Not applicable.

## **PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 CONSTRUCTION PHOTOGRAPHS
- 1.4 PROFESSIONAL FINAL PHOTOGRAPHS
- 1.5 CONSTRUCTION PROGRESS REPORTING
- 1.6 SCHEDULING ROLES
- 1.7 SCHEDULING SOFTWARE
- 1.8 SCHEDULES
- 1.9 CONSTRUCTION SCHEDULE INFORMATION
- 1.10 FORMAT
- 1.11 SUBMISSION PROCESS
- 1.12 BASELINE CONSTRUCTION SCHEDULE
- 1.13 PROGRESS SCHEDULE
- 1.14 BASELINE SCHEDULE REVISIONS

### **1.3 CONSTRUCTION PHOTOGRAPHS**

- .1 *Work* shall include progress photographs of construction taken from eight (8) viewpoints within the areas of *Work* by a professional photographer. One photograph is to be taken from each viewpoint per month for the duration of construction and one upon completion of construction. Viewpoint locations to be determined by the *Consultant* at the time of photographing.
- .2 Photographs shall show general extent of the work by interior views. Each viewpoint will be selected by the *Consultant*, and the monthly repetitive photographs taken from exactly the same viewpoint.
- .3 Submit digital copies of each photograph with each application for payment.
- .4 Title each photograph at the bottom so that nothing pertinent is blocked out. Include on title: *Project* name, *Contractor's* name, direction of view, and date when taken. *Provide* photographers name only on back of photographs.
- .5 Professional Photographer for Construction Photographs shall be approved by the *Consultant*.

### **1.4 PROFESSIONAL FINAL PHOTOGRAPHS**

- .1 Prior to release of deficiency holdback, the *Contractor* shall *Provide* to the *Consultant* the following required professional final photographs:
  - .1 Proof photographs of Professional Final Photographs taken from ten (10) vantage points selected by the *Consultant*.

- .2 *Provide* 2 DVD copies of Record Photographs in PDF format and in high resolution editable .tiff and .jpg formats.

- .2 Professional Final Photographs shall be included in the *Contract Price*.

## 1.5 CONSTRUCTION PROGRESS REPORTING

- .1 Maintain at the *Place of the Work* a permanent written record of progress of *Work*. Make the record available to *Consultant* and *Provide* copy if requested. Include in record each day:
  - .1 Commencement and completion dates of the work of each trade in each area of *Project*.
  - .2 Attendance of *Contractor's* and *Subcontractors* work forces at *Project* and a record of the work they perform.
  - .3 Visits to *Place of the Work* by *Owner*, *Consultant* authorities having jurisdiction, inspection and testing companies, *Contractor*, *Subcontractors*, and Suppliers.

## 1.6 SCHEDULING ROLES

- .1 Contractor
  - .1 The *Contractor* is responsible for the preparation and maintenance of Construction Schedule information including the Construction Schedule and other schedules as defined herein. The *Contractor* is responsible for obtaining planning and scheduling information from its management staff, site supervisory staff, *Subcontractors* and suppliers in a timely manner as an essential part of the preparation and maintenance of the Construction Schedule and other schedules as defined herein.
  - .2 The *Contractor* maintains full responsibility for the implementation and management of the construction activities contained in their schedules.
  - .3 The *Contractor* is to identify to the *Owner* and *Consultant* the *Contractor's* designated individual responsible for utilizing the specified scheduling software to prepare and maintain the Construction Schedule and other schedules, herein defined as the *Contractor's* Scheduler. The *Contractor's* Scheduler is required to have a minimum of 5 years of experience utilizing the specified scheduling software for planning and scheduling of construction project.

## 1.7 SCHEDULING SOFTWARE

- .1 The Construction Schedule is to be developed utilizing Microsoft *Project* (2003 or later version). Other third-party scheduling software's are not acceptable.

## 1.8 SCHEDULES

- .1 Construction Schedule: Submit a detailed critical path bar chart Construction Schedule with activities itemized to show the orderly planning, organization and execution of the *Work*, which will enable the *Contractor*, *Consultant* and *Owner* to monitor the progress of the *Work* and forecast remaining *Work*. Include in the schedule, the milestone dates for completion of each phase and other milestones specific herein.
- .2 The Construction Schedule is to be in the form of a series of activities and milestones that are logically linked utilizing the critical path methodology.
- .3 The Construction Schedule must clearly represent the applicable sequence of work as outlined in the *Contract Documents*. The Construction Schedule must identify early dates and late dates as

well as the *Project* critical path of activities and completion milestones through each phase of the *Project*.

- .4 Organize the Construction Schedule into the *Project's* phases as outlined in the *Contract Documents*. The Construction Schedule shall clearly identify the inter-relationships and logic dependencies between the work of different phases.
- .5 At any given point in time, the Construction Schedule must be fully detailed with activities and milestones for at least the next twelve (12) calendar months or for the entire project duration for projects under 12 months construction time. The level of schedule activity detail beyond the next twelve calendar months can be at a summary level that identifies major groups of activities and milestones for each phase.
- .6 The *Contractor* shall *Provide* further refined and expanded schedule information, as the *Work* progresses and in sufficient advance of the upcoming work. Dates for the development of this information shall be agreed with the *Owner, Consultant*.
- .7 In addition to the Construction Schedule, prepare and submit the following schedules, as specified in Section 01 33 00.
  - .1 Submittal Schedule for *Shop Drawings, Product Data* and Samples
  - .2 Submittal Schedule for Mock-ups
  - .3 Submittal Schedule of *Owner* supplied/*Contractor* installed equipment
  - .4 Equipment Delivery Schedule
  - .5 Building Commissioning and Turnover schedule, to be prepared together with *Owner*.

## 1.9 CONSTRUCTION SCHEDULE INFORMATION

- .1 Submission of the Construction Schedule shall constitute the representation by the *Contractor* that:
  - .1 The *Contractor* has distributed the proposed Construction Schedule to the *Subcontractors* for their review and comment.
  - .2 Seasonal weather conditions have been considered and included in the planning and scheduling of the *Work* influenced by high and low ambient temperatures and/or precipitation to ensure completion of the *Work* in accordance with the *Contract Documents*.
  - .3 The *Contractor* has incorporated any other special conditions in planning the *Work* such as specified non-work periods, etc.
  - .4 The *Work* has been co-ordinated and scheduled to permit time for work associated with the allowances (cash allowances) included as part of this *Contract*.
  - .5 The *Work* has been co-ordinated and scheduled to permit time for work associated with the alternatives included as part of this *Contract*.
- .2 Include the dates for the commencement and completion of each major task for each distinct part of the *Project* construction. Activities shall be itemized to show the orderly planning, organization and execution of the *Work*, which will enable the *Contractor* and the *Owner* to monitor the progress of the *Work* and forecast remaining *Work*.
- .3 Include activities in the Construction Schedule for the commencement and completion of each major element of all *Contractor* and *Subcontractor* work.

- .4 Include specific activities and milestones in the Construction Schedule for work under the responsibility of the *Owner* that must coordinate with the *Contractor's* work including but not limited to *Owner* supplied equipment, vacancy and move-in periods. Such activities will be identified by the *Contractor* and *Owner*.
- .5 Include specific activities and milestones in the Construction Schedule for work under the responsibility of the *Consultant* that must coordinate with the *Contractor's* work including but not limited to inspections and approvals. Such activities will be identified by the *Contractor* and *Consultant*.

#### 1.10 FORMAT

- .1 Prepare the Construction Schedule in the form of a time-scaled, horizontal bar chart that clearly identifies the *Project* critical path of activities and completion milestones for the distinct phases and sub- phases of the *Project*. *Provide* a separate bar identifying the start and finish of each significant element of construction as required to define a clear progression of activities through the distinct phases/sub- phases of the *Project* as specified in the *Contract Documents*.
- .2 Show sufficient detail to identify the major activities and milestones dates for overall planning and coordination purposes. Activities {with the exception of the contingency for unforeseen delays and delays resulting from changes to the *Contract*) shall have a maximum duration of 4 weeks. Show milestones for the start and completion of each major work area, building system and phase or sub- phase of the *Work*.
- .3 Ensure that work of all disciplines {i.e. mechanical, electrical and all other trades) is included and logically linked within the Construction Schedule. Show manufacturing time and delivery dates {milestones) for major equipment and materials. Show deliveries of *Owner* supplied equipment required to meet the Construction Schedule.
- .4 Activities must be in sufficient detail to include for decisions / approvals required by the *Owner* and/or *Consultant* for shop drawings, mock ups, sample submissions, deliveries, cash allowance requirement schedule, off site fabrication, erection, on site installation and any other events or sub activities which may pertain to the activities of the Construction Schedule.
- .5 Construction Schedule information should be in sufficient detail to allow for accurate assessment of percentage completion and coordination with other tasks within the *Project* Master Schedule.
- .6 *Provide* a horizontal time scale identifying the first day of each week as Monday. Show in the Construction Schedule the intended working days and holidays used as the basis for the Construction Schedule information and critical path calculations.
- .7 Activity descriptions should be as a consistent and clear as possible in terminology. Start activity descriptions with verbs.
- .8 Include as part of the Construction Schedule information, "dependency logic" information indicating the major predecessor and successor links between schedule activities. When requested, identify the crewing assumptions for the Construction Schedule activities and dependency logic that is governed by or representing crewing availability.

#### 1.11 SUBMISSION PROCESS

- .1 Submit the Construction Schedule information, to *Owner* within ten {10) working days from date of award of *Contract*. Construction Schedule information should be consistent with the milestones.
- .2 The *Owner* and *Consultant* shall have ten {10) *Working Days* from initial submission, to review and adjust the Construction Schedule, in consultation with the *Contractor*. The *Contractor* shall revise

and resubmit the Construction Schedule for further review and comment. Upon final review, that Construction Schedule will be defined as the "Baseline" version of the Construction Schedule.

#### **1.12 BASELINE CONSTRUCTION SCHEDULE**

- .1 The Baseline Construction Schedule will form the basis for *Contractor* and *Owner* planning and progress tracking.
- .2 No changes to the Baseline Construction Schedule reflecting later completion dates of activities or target milestones will be accepted as a revision to the Construction Schedule, unless accepted by *Owner* in writing.
- .3 Neither the review of the Baseline Schedule or other date submitted by the *Contractor* pursuant to this Section, nor any other action on the part of the *Consultant* under this section shall in any way be deemed as representation by *Owner* that the *Contractor*, by following a particular schedule or sequence of operation, can or will complete the *Work* by the time(s) required by the *Contract* or by any other time(s). The review of any Baseline Schedule or other date does not relieve the *Contractor* of his obligation to complete the *Work* by the time(s) required in the *Contract*.
- .4 Submit two paper copies on 11 x 17 inch (Ledger), plus electronic copy in native format from the agreed upon scheduling software. *Owner* will review schedule and return review copy.

#### **1.13 PROGRESS SCHEDULE**

- .1 On a monthly basis, update the Construction Schedule showing projected percentage of completion of each item as of the first day of the month. Indicate progress of each activity to date and projected start and finish dates for each activity. Upon submission this will be deemed the Progress Schedule.
- .2 Include the complete sequence of construction activities.
- .3 Show approved changes occurring since the previous submission of the Progress Schedule:
  - .1 Changes in scope/time
  - .2 Activities modified since previous submission
  - .3 Revised projections of progress and completion
  - .4 Other identifiable changes
- .5 Submit the Progress Schedule with each application for payment, clearly indicating progress of *Work* to date for which money is being claimed.
- .6 Submit a separate narrative report to define:
  - .4 Problem areas, anticipated delays, and the impact on the schedule
  - .5 Corrective action recommended and its effect
- .6 Indicate slippage from the schedule, its impact on completion of the phase and the total *Project*, and possible corrective actions. Appropriate corrective action may include, but not be limited to, assignment of additional labour, trade *Subcontractors* or equipment, shift or overtime work at no additional cost to the *Owner*.
- .7 Submit a separate six week "look-ahead" narrative report indicating major activities to be undertaken or constructed, areas of work, and any impacts upon the *Owner* over the next month.



#### **1.14 BASELINE SCHEDULE REVISIONS**

- .1 Updating the Construction Schedule, as required, to reflect actual progress up to the monthly cut-off date shall not be considered a revision to the Baseline Schedule. All other changes, including, but not limited to, the following shall be considered Baseline Schedule revisions:
  - .1 Adding and/or deleting activity relationships
  - .2 Adding and/or deleting activities
  - .3 Changes to original durations
  - .4 Changes to *Contract* Milestone dates or Constraint dates
  - .5 Performance of work out of sequence
  - .6 Scope Changes through *Change Orders*
- .2 If, as a result of the monthly Progress Schedule submission, it appears the Progress Schedule no longer represents the actual progress of the *Work*, the *Contractor* shall request, a revision to the Baseline Schedule in accordance with General Condition 11.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

### **1.3 CONTENTS**

PART 1 - GENERAL	1
1.1 GENERAL INSTRUCTIONS	1
1.2 SECTION INCLUDES	1
1.3 CONTENTS	1
1.4 ADMINISTRATIVE	1
1.5 BONDS, CERTIFICATES AND SCHEDULES	4
1.6 SCHEDULE OF SUBMITTALS	4
1.7 SUBMISSION PROCEDURES	5
1.8 PRODUCT DATA SHEETS	6
1.9 SHOP DRAWINGS	6
1.10 SAMPLES	9
1.11 CERTIFICATES AND CERTIFICATION SUBMITTALS	9
1.12 PROJECT FIRESTOPPING MANUAL AND COORDINATION	9
1.13 COORDINATION AND INTERFERENCE DRAWINGS	11
PART 2 - PRODUCTS	12
PART 3 - EXECUTION	12

### **1.4 ADMINISTRATIVE**

- .1 Submit to the *Consultant* all submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as not to cause any delay in the *Work*. Failure to submit in ample time will not be considered sufficient reason for an extension of the *Contract Time*, and no claim for extension by reason of such default will be allowed.
- .2 Submit only those submittals specifically required by the *Contract Documents*, or those specifically requested by the *Consultant*. Any submittals submitted that are not specifically required by the *Contract Documents*, or requested by the *Consultant*, will be returned to the *Contractor* at the *Contractor's* expense without being reviewed.
- .3 *Work* affected by a submittal shall not proceed until the review of that submittal is complete.
- .4 Submittals that contain substitutions will be rejected. Substitutions are permitted only when approved in accordance with Section 01 25 00.
- .5 The *Contractor's* review of submittals:
  - .1 The *Contractor* is to review submittals prior to submission to the *Consultant*. This review represents that the necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of the *Work* and all of the *Contract Documents*.

- .2 Submittals shall bear stamp of the *Contractor* and signature of a responsible official in the *Contractor's* organization indicating in writing that such submittals have been checked and coordinated by the *Contractor*. The *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.
- .3 Check and sign each submittal and make notations considered necessary before submitting to the *Consultant* for review. Where submittal is substantially and obviously in conflict with requirements of the *Contract Documents*, reject submittal without submitting to the *Consultant* and request resubmission.
- .4 The *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*.
- .5 Notify the *Consultant* in writing of changes made on submittals from the *Contract Documents*. The *Consultant's* review of submittals shall not relieve the *Contractor* of responsibility for changes made from the *Contract Documents* not covered by written notification to the *Consultant*.
- .6 Submittals that clearly have not been reviewed by the *Contractor*, or are not stamped, signed, dated, and identified as to the specific project, will be returned without being reviewed.
- .7 No changes to the *Work* or the *Contract Documents* shall be made by way of submittals.
- .8 .1 Changes to the *Work* shall only be made following procedures specified for changes in the *Work*.
- .9 .2 Submittals that include changes to the *Work* or the *Contract Documents* shall be shall be stamped "REVISE AND RESUBMIT" and returned.
- .6 The *Consultant's* review of submittals:
  - .1 Review of submittals by the *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 the *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 the *Contract Documents*.
  - .2 As part of their scope of work, *Consultant* shall review shop drawings no more than twice. Should three or more reviews be required due to reasons of *Contractor* omissions causing resubmission requests, then *Contractor* shall reimburse the *Consultant* for time expended in these extra reviews. Time shall be invoiced to the *Owner* (to be deducted from monies due to the *Contractor* and paid to *Consultant* by *Owner*) at rates recommended by *Consultant's* professional association and disbursements shall be invoiced at *Consultant's* cost. The *Contractor* shall cover directly costs and administration associated with courier services and the like for these extra shop drawing reviews.
  - .3 The *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*.
  - .4 The *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 received but not required by the *Contract Documents* or 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*.
  - .7 Prepare submittals using SI (metric) units.
  - .8 Verify that field measurements and affected adjacent work are coordinated.
  - .9 The *Contractor's* responsibility for errors and omissions in the submissions is not relieved by the *Consultant's* review of submittals.
  - .10 The *Contractor's* responsibility for deviations in the submission from the requirements of the *Contract Documents* is not relieved by the *Consultant's* review of submittals.
  - .11 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*.
    - .1 Once submitted, a submittal shall not be re-submitted until original submission has been reviewed by *Consultant* and returned to *Contractor*.
  - .12 Submittals that contain substitutions will be rejected. Substitutions are permitted only on substitution submittals as specified in Section 01 25 00.
  - .13 Do not proceed with work affected by a submittal, including ordering of Products, until relevant submittal has been reviewed by *Consultant*.
  - .14 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 include the *Consultant's* Submittal Review Form, as applicable, are permitted at the *Place of the Work*.
  - .15 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*.
  - .16 Engineered submittals:
    - .1 Submittals for items required to be engineered shall be prepared under the direct control and supervision of a Professional Engineer, registered in the *Place of the Work* and having the minimum professional liability insurance and requirements as required by the Professional Engineers of Ontario, who shall also apply his/her professional seal and signature to submittals prepared under their direct control and supervision.
    - .2 Include with engineered submittal, Professional Engineer's certificate 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, and *Authorities Having Jurisdiction*.

- .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. Prepare calculations in a clear and comprehensive manner so that they can be easily reviewed. Incomplete or haphazard calculations will be rejected.
- .5 The Professional Engineer responsible for the preparation of engineered submittals shall undertake periodic field review, including review of associated mock-ups, 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 Ontario 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 Professional 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*.

## 1.5 BONDS, CERTIFICATES AND SCHEDULES

- .1 Prior to commencement of the *Work*, the *Contractor* is required to *Provide* to the *Owner* a copy of the *Contractor's* current Certificate of Clearance from the Workplace Safety and Insurance Board.
- .2 No later than 10 *Working Days* prior to, and as a condition of, the first application for progress payment, the *Contractor* is required to submit the following to the *Consultant*:
  - .1 A copy of the *Contractor's* Certificate of Clearance from the Workplace Safety and Insurance Board provided to the *Owner* in accordance with paragraph 1.4.1 (above).
  - .2 A schedule of values for the parts of the *Work* showing values for each part of the *Work* distributed over each section of the *Technical Specifications* to the satisfaction of the *Consultant*. Make revisions to the schedule as required until acceptance by the *Consultant* is achieved.
  - .3 A construction progress schedule in accordance with paragraph 1.8 of this Section (below).
  - .4 Bonding information shall be submitted to the *Region* in accordance with the requirements of the *Contract Documents*.

## 1.6 SCHEDULE OF SUBMITTALS

- .1 Before commencement of the *Work*, submit to the *Consultant* a detailed schedule of submittals required by the *Contract Documents* correlated to the construction progress schedule specified under paragraph 1.8 of this section (below).

- .1 Schedule shall be accompanied by a checklist, correlated to both the schedule of submittals and the schedule of inspections and tests (specified under Section 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 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 the *Contractor* if volume and timing of submittals will permit timely review and response. The *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 the *Consultant's* review of submittals. When submittals have to be reviewed by one or more of the *Consultant's* subconsultants, add 5 more *Working Days* for a total of 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*.

## 1.7 SUBMISSION PROCEDURES

- .1 Coordinate each submittal with requirements of the *Work* and *Contract Documents*. Individual submittals shall include related information.
- .2 Distribute copies of submittals to parties whose work is affected by submittals except *Consultant* and *Owner* before final submission for review by *Consultant*.
- .3 Accompany submittals with transmittal letter, containing:

- .1 Date.
  - .2 *Project* title and number.
  - .3 *Contractor's* name and address.
  - .4 *Contractor's* review stamp.
  - .5 Identification and quantity of each submittal.
  - .6 Other pertinent data.
- .4 Each submittal shall be identified numerically by relevant 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 Submit original PDF documents only: scanned documents shall not be accepted.
  - .6 Make any changes in submittal that *Consultant* may require, consistent with *Contract Documents*, and resubmit as directed by *Consultant*.
  - .7 Notify *Consultant*, in writing when resubmitting, of any revisions other than those requested by *Consultant*.
  - .8 After *Consultant's* review, distribute copies to affected parties.

## 1.8 PRODUCT DATA SHEETS

- .1 Submit *Product* data sheets as follows:
  - .1 1 copy digitally in pdf format to *Consultant*
- .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.

## 1.9 SHOP DRAWINGS

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data which are to be provided by the *Contractor* to illustrate details of a portion of the *Work*.
- .2 The *Contract* shall submit shop drawings digitally in PDF format to the *Consultant*.
- .3 The *Contractor* shall *Provide* all shop drawings called for in the *Contract Documents* or as the *Consultant* may reasonably request.

- .4 The *Contractor* shall submit copies of reviewed shop drawings to *Authorities Having Jurisdiction* as required.
- .5 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and all other information necessary for completion of the work.
- .6 Where articles or equipment attach or connect to other articles or equipment, clearly indicate that such items have been coordinated, regardless of where in the *Contract Documents* the adjacent items are specified or indicated. Indicate cross references to the *Contract Documents*.
- .7 Shop drawings shall clearly define the division of responsibility. 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." It shall also be understood that any items, equipment, or description of the work shown on the shop drawings shall form a part of the *Contract Documents* unless specifically noted to the contrary. Shop drawings that do not clearly define the division of responsibility will be returned to the *Contractor* for same before being accepted for review by the *Consultant*.
- .8 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*.
  - .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.
- .9 Compatibility statement: Include with each shop drawing a statement that each *Product* and material indicated on the shop drawing is compatible with each other *Product* and material with which it comes into contact.
- .10 *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 RESUBMIT' and Shall be revised and resubmitted until *Consultant* stamps drawings with 'REVIEWED' or 'REVIEWED as NOTED'.
- .11 The *Consultant* will require a maximum of 10 *Working Days* from receipt of shop drawings for processing of same. The *Contractor* shall make allowances in the scheduling of the *Work* for this period of time for each submission and shall, also, make allowances in the schedule for the following potentialities:
- .1 If, upon review, adjustments are made on the shop drawings by the *Consultant* and they are returned to the *Contractor* marked "Revise and Resubmit," the shop drawing shall be revised as required and clean copies resubmitted to the *Consultant* for an additional review. The *Consultant* will, for each resubmission, require a maximum of 10 *Working Days* from receipt for processing of shop drawings.
  - .2 No claim for an increase in the *Contract Time* or claim for a change in the *Work* shall be considered or approved as a result of any of the following:
    - .1 The time taken for processing of shop drawings by the *Consultant* unless longer than 10 *Working Days* after receipt of same.
    - .2 The time taken by the *Contractor* for revision and resubmission of shop drawings.
    - .3 Any adjustments made on the shop drawings by the *Consultant* that are consistent with the intent of the *Contract Documents*.
- .12 Make the changes in the shop drawings as the *Consultant* may require, consistent with the *Contract Documents*. When resubmitting, notify the *Consultant* in writing of any revisions made other than those requested.

- .13 If, upon review by the *Consultant*, no errors or omissions are discovered or if only minor corrections are made, all submitted copies of the shop drawing (except the two retained by the *Consultant*) will be returned to the *Contractor* marked as "Reviewed" or "Reviewed as Noted", and fabrication or installation of the work may proceed.
- .14 Upon completion of review by *Consultant*, 1 marked set of shop drawings will be returned to *Contractor* in digital format for reproduction and distribution.
- .15 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.
- .16 Submit copies of reviewed shop drawings to authorities having jurisdiction as required.

#### **1.10 SAMPLES**

- .1 Submit for review samples as requested in the *Contract Documents*. Label samples as to origin and intended use in the *Work*.
- .2 Unless otherwise directed by the *Consultant*, deliver samples prepaid to the *Site* office and notify the *Consultant* in writing of the availability of sample for review.
- .3 Notify the *Consultant* in writing at the time of submission of any deviations in the samples from the requirements of the *Contract Documents*.

#### **1.11 CERTIFICATES AND CERTIFICATION SUBMITTALS**

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

#### **1.12 PROJECT FIRESTOPPING MANUAL AND COORDINATION**

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

- .2 Listing agency's detailed drawing showing joint assemblies and firestopping materials, identified with listing agency's name and number or designation, fire rating achieved, and date of listing.
  - .3 Manufacturers' installation instructions and recommendations.
- .3 Shop drawings:
  - .1 Submit drawings indicating fire resistance rated assembly number, required temperature, hose stream, and flame rating, material thicknesses, installation methods and materials of firestopping and smoke seals, primers, supports, damming materials as applicable, reinforcements, anchorages, fastenings and methods of installation for each condition to be encountered.
  - .2 Designate on shop drawings static through penetrations and dynamic joint systems, relative positions, expansion and control joints in rated slabs and walls, and firestopping details.
  - .3 Engineered shop drawings, for engineering judgements:
    - .1 Where *Project* conditions require modification to an accredited third party testing agency's listed system design to address a particular firestopping condition that is not covered by a listed system, submit engineered shop drawings detailing the modifications to the listed system design as an engineering judgment or equivalent fire resistance-rated assembly, for each *Project* location and condition.
    - .2 Submit the manufacturer's engineering judgment identification number and shop 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 Fire resistance rating test listings for firestopping and smoke seal systems.
- .3 Firestopping manual shall be submitted within 4 weeks of *Contract* award.
- .4 Prior to concealment of firestopping conditions above a ceiling or by another assembly or finish, the *Contractor* shall submit an updated firestopping manual including as-built drawings that identify firestopping conditions and penetrations.
- .5 Closeout submittals:
  - .1 Submit closeout submittals in accordance with Section 01 77 00.
  - .2 Submit the following certification documents with closeout submittals:
    - .1 Manufacturer's certification: Submit manufacturer's certification that installed firestopping and smoke seal Products are suitable for the use indicated and comply with specified requirements.

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

### 1.13 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, new and existing structural work and conduit runs) 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 03 and 05, and 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.
- .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 rebar, 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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 GENERAL SUMMARY**

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

#### **.2 SECTION INCLUDES**

### **1.3 CONTENTS**

.1	Part 1 - General	1
.2	1.1 General Summary	1
.3	1.2 Section Includes	1
.4	1.3 Contents	1
.5	1.4 Related Sections	1
.6	1.5 Administrative Requirements	1
.7	1.6 Quality Assurance	2
.8	1.7 submittals	3
.9	Part 2 – Products	3
.10	Part 3 - Execution	3

### **1.4 RELATED SECTIONS**

- .1 01 45 00 - Quality Control
- .2 01 57 20 - Temporary Indoor Air Quality Control
- .3 07 05 23 - Air Tightness Testing
- .4 23 05 93 - Testing, Adjusting, Balancing
- .5 23 08 00 - HVAC System Commissioning

### **1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Contractor Responsibilities
  - .1 Unless otherwise indicated as the responsibility of another identified entity, the Contractor shall provide coordination of the trades, and the sequence of construction to ensure all energy efficiency and air tightness requirements relating to construction activities and tasks have been met. Coordinate the sequence of activities to accommodate required services

- with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
- .2 The Contractor shall provide the necessary orientation for all subcontractors.
  - .3 The Contractor shall ensure that all applicable materials and products meet the requirements relating to energy efficiency and air tightness. Compliance shall be demonstrated by providing the documentation required in the corresponding specification section.
  - .4 The Contractor shall implement and maintain the temporary indoor air quality protection measures required in section 01 57 20.
  - .5 The Contractor shall acquire photos throughout construction as requested by the Owner and Energy Consultant.
  - .6 The Contractor shall work with the Owner, Architect, Commissioning Agent, Mechanical Consultant and Energy Consultant to coordinate, schedule and accommodate all testing, inspection, and quality assurance activities. For reference, testing activities will include:
    - .1 Whole-building air tightness testing,
    - .2 Heating, cooling and ventilation air distribution system measurement and balancing.
  - .7 The Contractor shall allow enough time for testing, evaluation, alterations and re-testing so as not to interrupt the Progress Schedule for the Project.
  - .8 The Contractor shall cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
    - .1 Provide access to the Work,
    - .2 Furnish incidental labour and facilities necessary to facilitate inspections and tests.
  - .2 Subcontractors shall comply with all procedure and submittal requirements as detailed within the related specifications sections as they pertain to their scope of work.
  - .3 Pre-Construction Meeting: After award of contracts and prior to mobilization onsite, the Contractor shall schedule a meeting with the Owner and Design Team to discuss the execution and documentation requirements as detailed within the related specification sections. Please note that this meeting is separate from any training (e.g. air tightness) sessions that are required in other sections.
  - .4 Site Review Report Responses: The Energy Consultant will conduct inspections intermittently throughout construction. Feedback will be provided to the Contractor in the form of Site Review reports. The Contractor shall respond to all high and medium priority issues identified in the report within 5 working days from the time it was issued. The response shall be in written format and correspond to the item numbers used in the original report. If required, the Contractor shall provide photos and/or other supporting documentation that has been requested to demonstrate that the identified issues have been addressed.

## **1.6 QUALITY ASSURANCE**

- .1 Materials and workmanship will be subject to inspection at any time. Cooperate in permitting access for inspection to all places where work is being done or stock is being stored. Refer to Section 01 45 00 and related Sections.

- .2 Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- .3 Owner's quality control inspection and testing is specified in the technical sections and will be paid for directly by the Owner except as otherwise specified. Contractor to pay for inspections and re-testing to verify acceptability of corrected work.

#### **1.7 SUBMITTALS**

- .1 Photographs
  - .1 Upon Project completion, the Contractor shall upload all required photographs taken during construction to an FTP or Cloud-based site setup by the Architect.

#### **PART 2 – PRODUCTS**

NOT USED

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

NOT USED

**- END OF SECTION –**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 This section describes requirements applicable to all Division Sections.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 REFERENCE STANDARDS
- 1.4 RESPONSIBILITY
- 1.5 SAFETY ACTIVITIES
- 1.6 POSTING OF DOCUMENTS
- 1.7 CORRECTION OF NON-COMPLIANCE
- 1.8 HAZARDOUS WORK
- 1.9 WORK STOPPAGE
- 1.10 FIRE PROTECTION

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

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

### **1.3 REFERENCE STANDARDS**

- .1 Safety Province of Ontario: Occupational Health and Safety Act, Regulation and Code R.S.A - Amended 1995, including requirements for a "Prime Contractor" as defined by the Act.

### **1.4 RESPONSIBILITY**

- .1 The "Prime Contractor" according applicable local jurisdiction, is responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site specific Health and Safety Plan.
- .3 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Consultant verbally and in writing.

### **1.5 SAFETY ACTIVITIES**

- .1 Perform site specific safety hazard assessment related to project.
- .2 Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.
- .3 Perform Work in accordance with Section 01 41 00 - Regulatory Requirements and this section.

## **1.6 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Consultant.

## **1.7 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Consultant.
- .2 Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Consultant may stop Work if non-compliance of health and safety regulations is not corrected.

## **1.8 HAZARDOUS WORK**

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Consultant.
- .2 Use powder actuated devices only after receipt of written permission from Owner.

## **1.9 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

## **1.10 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.
- .3 Maintain placed or installed fire resistive construction to protect the portions of the Work during construction.

## **PART 2 - PRODUCTS**

Not applicable.

## **PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Overview of LEED v4 requirements and procedures
- B. Definitions of common LEED v4-related terminology

### **1.02 RELATED SECTIONS**

- A. 01 35 66 LEED v4 Project Management and Coordination
- B. 01 57 13 Construction Activity Pollution Prevention for LEED v4
- C. 01 60 13 LEED v4 Product Requirements
- D. 01 74 19 Waste Management Requirements for LEED v4
- E. 01 81 19 Indoor Air Quality Management for LEED v4
- F. 01 81 14 Indoor Air Quality Testing or Flush-out for LEED v4

### **1.03 DEFINITIONS**

- A. LEED: Leadership in Energy & Environmental Design is a voluntary, consensus-based, market responsive set of criteria that evaluate project performance from a whole-building perspective. It is a points-based system that requires documentation throughout the project phases.
- B. LEED v4 Certification: Projects may earn certification at one of four levels (Platinum, Gold, Silver, Certified) in recognition of achieving prerequisites and credits based on documentation submitted to and reviewed by the U.S. Green Building Council (USGBC).
- C. LEED Credit: fundamental criteria related to a particular design or construction issue which corresponds to point awards.
- D. LEED Prerequisite: mandatory criteria related to a particular design or construction issue. No points are awarded for achieving LEED prerequisites. If one or more LEED prerequisites are not met, the project is ineligible for LEED certification.
- E. USGBC: U.S. Green Building Council is a broad-based inclusive coalition of representatives from different segments of the design and building industry. The Council works to change industry standards, develop best design practices and guidelines; advocate for green buildings, and develop educational tools to support its members in implementing sustainable design and construction practices.
- F. Environmental Product Declaration (EPD): A transparent, objective report that communicates what a product is made of and how it impacts the environment across its entire life cycle.

- G. Third-Party Certifications: Multiple attribute standard(s) developed by a consensus-based process from an approved standard development organization. Examples include NSF sustainability assessment standards, UL Environment sustainability standards, sustainable forestry certifications, and other consensus-based assessment standards that are multiple attribute and life cycle based.
- H. Corporate Responsibility Report (CSR): is a corporation's initiatives to assess and take responsibility for the company's effects on environmental and social wellbeing.
- I. Life-Cycle Assessment (LCA): A technique to assess environmental impacts associated with all the stages of a product's life from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling.
- J. Health Product Declaration (HPD): are a standard format for transparent disclosure of building product ingredients and associated hazards. HPDs were created by the Health Product Declaration Collaborative
- K. GreenScreen v1.2 Benchmark: is a method for chemical hazard assessment designed to identify chemicals of high concern and safer alternatives. GreenScreen supports environmentally preferable product procurement tools including standards, scorecards and ecolabels.
- L. Cradle to Cradle: is a non-profit Institute that is an agent of change through open source information. Products are assessed across five quality categories and certification is awarded at five levels.
- M. Declare: offers a platform for public disclosure by taking complex chemical analysis and raw material source location information and providing it to consumers in an easy-to-use materials label.
- N. GreenGuard Gold: a testing standard that ensures a product has met some of the world's most rigorous and comprehensive standards for low emissions of volatile organic compounds (VOCs) into indoor air.
- O. Indoor Advantage Gold-SCS Global Services: certifies interior products for low VOC emissions with the most transparent indoor air quality (IAQ) standard for furniture and building materials.
- P. FloorScore-SCS Global Services: is the most recognized indoor air quality (IAQ) certification standard for hard surface flooring materials, adhesives, and underlayment.
- Q. Carpet & Rug Institute (CRI) Green Label Plus: VOC emissions program for carpet, adhesives and cushion that set higher standards for IAQ and ensure that customers are purchasing the very lowest emitting products on the market.

- R. Recycled Content: the percentage (by mass) of constituents that have been recovered or otherwise diverted from the solid waste stream, either after the manufacturing process (post-industrial) or after consumer use (post-consumer) and as further defined as follows:
1. Post-Consumer Recycled Content: the percentage (by mass) of recycled material that is derived from previously used consumer products (e.g., aluminum and steel cans, glass and plastic bottles, asphalt from parking lots, gypsum from drywall etc.).
  2. Pre-Consumer Recycled Content: the percentage (by mass) of recycled material that is diverted from the waste stream during a manufacturing process to be reprocessed into a new consumer product. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product ("in-house" recycling) are excluded. Examples of pre-consumer recycled content include: sawmill dust used in MDF board, blast furnace slag used in mineral wool insulation, and coal fly ash used in concrete mixes.
- S. Regionally Extracted, Manufactured and Purchased: Building material or product in which the raw materials are extracted, manufactured and purchased (including distributor) in the region of the project, defined by LEED as within a radius of 160 km from the project site.
- T. Bio-based Material: Materials made from agricultural products that are typically harvested within a ten-year or shorter cycle. Bio-based products must meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. LEED excludes hide products, such as leather and other animal skin material.
- U. Supplementary Cementing Materials (SCMs): SCMs are used to partially replace Portland cement in concrete mixtures. Typical examples include fly ash, ground or granulated blast furnace slag, silica fume.
- V. FSC-Certified Wood Products: Forest Stewardship Council (FSC) is an international not-for-profit membership-based organization geared to find solutions to the problems created by poor forestry practices and to reward sustainable forest management. Products bearing the FSC stamp have been harvested from a sustainably-managed forest.
- W. Chain of Custody Certification: awarded to companies that process, manufacture, and/or sell products made of FSC-certified wood and meet FSC rules and audit requirements.
- X. Urea-Formaldehyde (UF): A combination of urea and formaldehyde that readily decomposes at room temperature. It is found in some glues/resins used to manufacture furniture, composite woods (e.g. particle board), agrifiber products and laminated assemblies.

- Y. Volatile Organic Compounds (VOCs): Organic chemicals that produce vapours readily at room temperature and normal atmospheric pressure (e.g. gasoline, solvents, etc.). VOCs react with sunlight and nitrogen to form ground-level ozone, a chemical that has detrimental effect on human health, agricultural crops, forests, soil, groundwater and ecosystems.

#### **1.04 REFERENCES**

- A. LEED v4 Building Design and Construction guide for New Construction, U.S. Green Building Council, Credit Library.
- B. LEED v4.1 Building Design and Construction guide for New Construction, U.S. Green Building Council, Credit Library.
- C. Sheet Metal and Air-Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008 (Chapter 3)

#### **1.05 OBJECTIVES**

- A. To achieve certification under the LEED v4 Building Design and Construction guide for New Construction and Core & Shell administered by the U.S. Green Building Council by meeting the requirements of the construction-related LEED prerequisites and credits identified by Owner and LEED Consultant.
1. No single manufacturer, fabricator, or subcontractor can fulfill the total requirements for LEED certification for the project. LEED certification requires the cooperation and diligence of all project participants for a successful application and acceptance for LEED certification.
  2. Failure to provide products or methods of construction contributing towards LEED prerequisites may result in the Owner achieving a Certification less than that specified or none at all. The Owner reserves the right to seek compensation where failure to achieve Certification is a result of direct neglect or misrepresentation of any material or construction method.
- B. To construct a space that uses land, water, energy and material resources appropriately and efficiently and provides a safe, comfortable and productive indoor environment for building occupants in accordance with the LEED requirements.
1. Reduce pollution from construction activities by implementing an Erosion and Sedimentation Control Plan.
  2. Reduce the impact of Demolition and Construction waste on landfill by implementing a Waste Management Plan that ensures waste diversion methods including reducing, reusing and recycling are employed.

3. Employ resource conservation measures that may include recycled, regional, rapidly renewable, salvaged, refurbished and reused materials and use of wood from sustainably-managed forests.
4. Protect indoor air quality during construction and occupancy phases by implementing an Indoor Air Quality Management Plan that employs methods including, but not limited to:
  - a. Installation of materials and products that contain no or lower amounts of harmful chemicals such as VOCs and urea formaldehyde.
  - b. Following SMACNA's Guidelines for Occupied Buildings Under Construction.

**1.06 DESCRIPTION OF WORK**

- A. The Contractor shall construct the project in accordance with LEED prerequisites and the targeted points identified in the LEED v4 BD+C Checklist.
- B. The Contractor shall coordinate LEED construction activities and documentation as per Section 01 35 66 LEED v4 Project Management and Coordination.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Overview of LEED v4 project management and coordination requirements, including submittals.

### **1.02 RELATED SECTIONS**

- A. 01 35 63 General LEED v4 Requirements
- B. 01 57 13 Construction Activity Pollution Prevention for LEED v4
- C. 01 60 13 LEED v4 Product Requirements
- D. 01 74 19 Waste Management Requirements for LEED v4
- E. 01 81 19 Indoor Air Quality Management for LEED v4

### **1.03 DEFINITIONS**

- A. See Section 01 33 63 General LEED v4 Requirements.

### **1.04 REFERENCES**

- A. LEED v4 Building Design and Construction Guide for New Construction, U.S. Green Building Council, Credit Library.
- B. LEED v4.1 Building Design and Construction Guide for New Construction, U.S. Green Building Council, Credit Library.

### **1.05 OBJECTIVES**

- A. To achieve certification under the LEED v4 BD+C for New Construction administered by the U.S. Green Building Council by meeting the requirements of the LEED prerequisites and credits identified in the LEED v4 BD+C Checklist attached to these specifications.
  - 1. No single manufacturer, fabricator, or subcontractor can fulfill the total requirements for LEED certification for the project. LEED certification requires the cooperation and diligence of all project participants for a successful application and acceptance for LEED certification.
  - 2. Failure to provide products or methods of construction contributing towards LEED prerequisites may result in the Owner achieving a Certification less than that specified or none at all. The Owner reserves the right to seek compensation where failure to achieve Certification is a result of direct neglect or misrepresentation of any material or construction method.



## **1.06 DESCRIPTION OF WORK**

- A. The Contractor shall designate a project team member responsible for all LEED construction and documentation activities.
1. The site superintendent will be responsible for all on-site LEED requirements throughout the project, including supervising on-site sub-contractors to ensure LEED construction requirements are met.
    - a. The site superintendent will keep a copy of the Erosion and Sedimentation Control Plan on site and post a summary of all requirements in a conspicuous location on site
    - b. The site superintendent will keep a copy of the Construction Waste Management Plan on site and maintain a LEED documentation binder that contains logs, waste diversion reports, and waste tickets.
    - c. The site superintendent will maintain a LEED documentation binder on site that contains logs, back-up documentation for all and only products approved for the project.
    - d. The site superintendent will keep a copy of the IAQ management plan on site and post a summary of all requirements in a conspicuous location on site.
  2. The Contractor will designate one member of the project team to be responsible for all LEED documentation requirements as described in this section.
    - a. The designated team member will serve as the main contact for the LEED Consultant and retain the responsibilities related to LEED documentation throughout construction and close-out procedures.
    - b. The designated team member will be responsible for communicating LEED requirements to the site superintendent and sub-contractors before they mobilize on site.
    - c. The designated team member will coordinate with the site superintendent to ensure the on-site LEED documentation binder is updated continuously.
- B. The Contractor shall schedule and coordinate all construction activities of own forces and sub-contractors to ensure LEED prerequisites and the targeted LEED credits are met as per the LEED v4 BD+C Checklist.
1. Contractor will implement and ensure an Erosion and Sedimentation Control Plan is followed throughout the project.

2. Contractor will implement and ensure a Construction Waste Management Plan is followed throughout the project.
3. Contractor will ensure all LEED contractor submittal requirements as described below are met.
4. Contractor will implement and ensure an Indoor Air Quality Management Plan is followed throughout the project.
5. Contractor will hold a LEED Kick-Off Meeting and LEED Coordination Meeting as described below.
6. Contractor will hold LEED progress meetings as described below.

#### **1.07 LEED KICK-OFF and COORDINATION MEETINGS**

- A. Prior to the start of construction, the Contractor shall hold a LEED kick-off meeting with the Consultant to review the LEED requirements of the project. This meeting shall include a review of:
  1. LEED v4 certification and performance objectives
    - a. LEED v4 BD+C Checklist
  2. LEED requirements and procedures including:
    - a. Erosion and Sedimentation Control Plan
    - b. Construction Waste Management Plan
    - c. Product and Material Requirements
    - d. LEED documentation and submittal
    - e. Indoor Air Quality Management Plan
    - f. Project Schedule as related to LEED requirements
  3. The site superintendent and project team member responsible for LEED documentation will attend the LEED Kick-Off meeting.
- B. Prior to start of construction, the Contractor (in conjunction with the Consultant) shall hold a coordination meeting with the construction team to explain the LEED requirements to the Sub-Contractors. This meeting shall include a review of:
  1. LEED v4 certification and performance objectives
  2. LEED requirements and procedures including:

- a. Erosion and Sedimentation Control Plan
  - b. Construction Waste Management Plan
  - c. Product and Material Requirements
  - d. LEED documentation and submittals
  - e. Indoor Air Quality Management Plan
  - i. Project Schedule as related to LEED requirements
- 3. The site superintendent and project team member responsible for LEED documentation will attend the LEED Coordination meeting
- C. The Contractor shall ensure that the appropriate representatives from subcontractors/trades attend the LEED Coordination Meeting. If any subcontractors/trades are unable to attend this meeting, the Contractor shall make arrangements to host additional LEED Coordination Meetings to suit.

#### **1.08 LEED PROGRESS MEETINGS**

- A. LEED progress will be a specific agenda item at each regular site meeting
  - 1. The Contractor in conjunction with the Consultant will discuss outstanding requirements, project progress and future needs.
  - 2. Attendees to include:
    - a. Owner (or authorized representative)
    - b. Project Manager (or authorized representative)
    - c. Architect (or authorized representative)
    - d. Contractor's project team including:
      - i. project manager
      - ii. site superintendent
      - ii. designated team member responsible for LEED documentation
    - e. Major subcontractor teams, including:
      - i. project manager
      - ii. site foreman
    - f. Major suppliers/manufacturers

3. All attendees shall be familiar with the project and authorized to conclude matters relating to the Work.

#### **1.09 SUBMITTALS**

- A. Erosion and Sedimentation Control Plan as described in 01 57 13 Construction Activity Pollution Prevention for LEED v4 shall be submitted by the Contractor prior to mobilization on site and revised upon request of the Consultant
  1. Erosion and Sedimentation Control Logs and corresponding supporting documentation shall be submitted monthly as per 01 57 13 Construction Activity Pollution Prevention for LEED v4
- B. Construction Waste Management Plan as described in 01 74 19 Waste Management Requirements for LEED v4 shall be submitted by the Contractor prior to mobilization on site and revised upon request of the Consultant
  1. Waste Calculator and corresponding supporting documentation shall be submitted on a monthly basis as per 01 74 19 Waste Management Requirements for LEED v4
- C. Indoor Air Quality Management Plan as described in Section 01 81 19 shall be submitted by the Contractor prior to mobilization on site and revised upon the request of the Consultant
  1. Indoor Air Quality Inspection Logs shall be completed weekly and submitted on a monthly basis as per 01 81 19 Indoor Air Quality Management for LEED v4
- D. Materials tracking forms and calculators - Building Products (BPDO) and Low Emitting Materials (LEM) along with corresponding supporting documentation (manufacturer data sheets, manufacturer letters, etc.) shall be submitted 2 weeks prior to the corresponding subcontractors/trades mobilizing on site. Additional documentation to reflect any substitution or changes in scope will be submitted on a monthly basis by the Contractor as per 01 61 00 LEED v4 Product Requirements and revised upon the request of the Consultant. Materials cost should include all taxes and delivery costs incurred by the contractor but exclude any cost for labor and equipment after the material is delivered to the site.
- E. Photographs shall be provided by the Contractor as specified in Section 01 81 19 Indoor Air Quality Management for LEED v4 and in Section 01 57 13 Construction Activity Pollution Prevention for LEED v4. Submit monthly. All photos taken for LEED documentation purposes shall conform to the following requirements:
  1. Resolution: High resolution digital images (1280 x 1024 or higher)
  2. Date Stamp: Standard indicating YYYY-MM-DD

- F. Final Submittals, including outstanding LEED documentation and Final Materials Cost shall be submitted by the Contractor within 14 days of substantial completion of the project
- G. The Consultant will provide access to LEED Forms in LEED Online upon the successful completion of the prerequisites and credits. The Contractor shall review, electronically sign and confirm completion to the Consultant as an accurate indication of the construction performance.
- H. The Owner reserves the right to withhold Progress Payments pending the submission of documentation or completion of actions required to achieve LEED certification.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Objectives
- .4 1.4 Description of Work
- .5 1.5 Related Work Specified Elsewhere
- .6 1.6 Reference Standards
- .7 1.7 Submittals
- .8 1.8 Product Requirements
- .9 1.9 Site Assessment
- .10 1.10 VOC – Products and Materials Identification – Refer to Schedule A (SECTION 01 35 90.1)
- .11 1.11 Sources of Pollutants – Refer to Schedule B (SECTION 01 35 90.1)
- .12 1.12 IAQ Pollutant Containment Measures - Refer to Schedule C (SECTION 01 35 90.1)
- .13 1.13 Housekeeping Measures - Refer to Schedule D (SECTION 01 35 90.1)
- .14 1.14 Scheduling Measures - Refer to Schedule E (SECTION 01 35 90.1)
- .15 1.15 HVAC Protection Measures - Refer to Schedule F (SECTION 01 35 90.1)
- .16 1.16 IAQ Testing
- .17 1.17 Installation of Products
- .18 1.18 Removal of Products

### **1.3 OBJECTIVES**

- .1 The *Contractor* shall protect construction workers and future building occupants from indoor air quality problems resulting from construction activities and building materials.
- .2 The *Contractor* shall reduce the production and circulation of pollutants during construction.
- .3 The *Contractor* shall protect equipment and absorptive materials stored and installed on-*Site* from moisture, dust, and dirt accumulation during construction.
- .4 Following construction and prior to occupancy, the *Contractor* shall demonstrate that the building has been suitably prepared for occupancy by performing baseline Indoor Air Quality (IAQ) testing.
- .5 The *Contractor* shall ensure that the *Contractor* and its *Subcontractors* shall meet or exceed the requirements of LEED® Canada -NC Version 4.1 credits "Construction IAQ Management Plan", and EQc4 Low-Emitting Materials.

### **1.4 DESCRIPTION OF WORK**

- .1 Identify, implement and document (using photographs and compliance checklists) the measures applied to achieve the IAQ management objectives.

- .2 Meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2<sup>nd</sup> Edition, 2007, ANSI/SMACNA 008-2008 (Chapter 3).
- .3 Control the sources of pollutants by selecting low-emitting *Products*, using appropriate equipment (e.g., power tools that do not burn fossil fuels) and changing work practices (e.g., change techniques to reduce emissions, use vacuum dust collection systems, etc.).
- .4 Contain work areas (e.g., close doors, use dust curtains, etc.) to prevent the circulation of pollutants.
- .5 Suspend or modify HVAC operation to prevent the circulation of pollutants.
- .6 Intensify housekeeping to remove pollutants from the *Site*.
- .7 Cover, seal and protect materials stored and installed on-*Site* from moisture, dust and dirt accumulation.
- .8 Reschedule work hours to prevent worker exposure to pollutants.
- .9 Make suitable preparations for occupancy (Building flush-out period, or Indoor Air Quality Testing).
- .10 Complete and implement the IAQ Management Schedules included as a Supplement to this Section (Section 01 35 90.1 – IAQ Management Schedules) with this Specification. Provide all necessary documentation to support implementation.
- .11 Replace all filtration media immediately prior to the flush-out and immediately prior to occupancy.

## 1.5 RELATED WORK SPECIFIED ELSEWHERE

- .1 Section 01 35 90.1 – Indoor Air Quality Management Schedules.

## 1.6 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning National Contractors Association (SMACNA); IAQ Guidelines for Occupied Buildings Under Construction. First Edition, 1995.
- .2 ASHRAE. ANSI/ASHRAE 52.2-2007: Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size.
- .3 EPA. EPA Protocol for Environmental Requirements, Testing for Indoor Air Quality Baseline IAQ.
- .4 Canadian Green Building Council. "Indoor Environmental Quality Credit 3: Construction IAQ Management Plan and Credit 4: Low-Emitting Materials"
- .5 LEED® Canada Reference Guide for Green Building Design and Construction v4.1

## 1.7 SUBMITTALS

- .1 IAQ Management Schedules
  - .1 To be submitted by the *Contractor* prior to the start of construction:
    - .1 Source Control - Schedule B
    - .2 Pathway Interruption - Schedule C
    - .3 Housekeeping - Schedule D
    - .4 IAQ Scheduling - Schedule E

- .5 HVAC Protection - Schedule F
- .2 All IAQ Management Schedules, other than Schedule A, shall be submitted to the *Consultant* 14 *Working Days* after the *Subcontractor* orientation meeting for review and acceptance.
- .3 Maintain one complete set of IAQ Management schedules at the job *Site*.
- .2 Photographs
  - .1 Provide photographs as specified in the IAQ Management Schedules.
  - .2 Photographs must be taken monthly during construction to prove sustained compliance.
  - .3 Photographs must be accompanied by the date taken, and a description of the indoor air quality management measure depicted.
- .3 IAQ Management Inspection Log
  - .1 All indoor air quality management measures shall be inspected on a weekly basis by the consultant and any deficiencies shall be remedied.
  - .2 Inspections shall be recorded in the IAQ Management log and shall denote any deficiencies as well as corrective action taken during the weekly inspections.
  - .3 The IAQ Management Inspection Log shall be provided to the *Consultant* for review if requested. This log shall be started when the building is enclosed and shall carry through to building turnover to the *Owner*.
  - .4 After building turn-over, a complete copy of the IAQ Management Inspection Logs for the duration of the *Project* shall be provided to the *Consultant* for documentation purposes.

## 1.8 PRODUCT REQUIREMENTS

- .1 The following chart outlines the maximum Volatile Organic Compound (VOC) limits for products used on the interior of the building (i.e. inboard side of the weatherproofing system and applied onsite).
- .2 VOC Product Limits
  - .1 California South Coast Air Quality Management District Rule #1168;

Architectural Applications	VOC Limit (g/L)
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Wood Flooring Adhesives	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
Vinyl Composition Tile (VCT) and Asphalt Tile Adhesives	50
Dry Wall and Panel Adhesives	50
Cove Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Grout and Mortar	250
Specialty Applications	VOC Limit (g/L)



Polyvinyl Chloride (PVC) Welding	510
Chlorinated Polyvinyl Chloride CPVC Welding	490
American Bureau of Shipping (ABS) Welding	325
Plastic Cement Welding	250
Adhesive Primer for Plastic	550
Contact Adhesive	80
Special Purpose Contact Adhesive	250
Structural Wood Member Adhesive	140
Top and Trim Adhesive	250
<b>Substrate Specific Applications</b>	<b>VOC Limit (g/L)</b>
Metal to Metal	30
Plastic Foams	50
Porous Material (except wood)	50
Wood	30
Fiberglass	80
<b>Sealants</b>	<b>VOC Limit (g/L)</b>
Architectural	250
Non-Membrane Roof	300
Single-Ply Roof Membrane	450
Other	420
<b>Sealant Primers</b>	<b>VOC Limit (g/L)</b>
Architectural, Non-Porous	250
Architectural, Porous	775
Modified Bituminous	500
Other	750

1. Green Seal GS-36 for Commercial Adhesives

<b>Aerosol Adhesives</b>	<b>VOC Weight (g/L minus water)</b>
General purpose mist spray	65% VOCs by weight
General purpose web spray	55% VOCs by weight
Special purpose aerosol adhesives (all types)	70% VOCs by weight

2. Green Seal GS-11 VOC Levels for Paints and Coatings

<b>Paints (GS-11)</b>	<b>VOC Limit (g/L)</b>
Interior Non-Flat Coating	150
Interior Flat Coating	50

3. GS-03 VOC Levels for Anti-Corrosive/Anti-Rust Paint

--	--

Anti-Corrosive Paints (GS-03)	VOC Limit (g/L)
Anti-Corrosive Coatings, Gloss	250
Anti-Corrosive Coatings, Semi-Gloss	250
Anti-Corrosive Coatings, Flat	250

4. California South Coast Air Quality Management District Rule #1113;

Table of Standards	VOC Limit (g/L)
Clear Wood Finishes, Varnish	350
Clear Wood Finishes, Sanding Sealers	350
Clear Wood Finishes, Lacquer	550
Clear Brushing Lacquer	680
Concrete-Curing Compounds	350
Floor Coatings	100
Japan/Faux Finishing Coatings	350
Magnesite Cement Coatings	450
Pigmented Lacquer	550
Primers, Sealers, and Undercoaters	200
Shellac, Clear	730
Shellac, Pigmented	550
Stains	250
Waterproofing Sealers	250
Waterproofing Concrete/Masonry Sealers	400
Wood Preservatives	350
Low-Solids Coating	120*

\*Measured in grams of VOC per litre of material, including water.

.3 Carpet System Requirements

- .1 All carpet must meet the requirements of the Carpet and Rug Institute's Green Label Plus program.
- .2 All carpet cushion must meet the requirements of the Carpet and Rug Institute's Green Label program.

.4 Flooring Requirements

- .1 All hard surface flooring covered by FloorScore standard must be certified as compliant.
- .2 Or, all hard surface flooring products must comply with testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources using Small Scale Environmental Chambers including 2004 Addenda.

.5 Composite Wood, Agrifibre Products & Laminates

- .1 All composite wood and agrifibre products must not contain added urea formaldehyde resins. Laminating adhesives must not contain urea-formaldehyde.

.6 Filtration Media Requirements

- .1 MERV 8 Filters: To be used on all return grilles for any equipment that is to be operated during construction.

- .2 MERV 13 Filters: Refer to 3.11 HVAC protection Measures (Option 1 and Option 2).

## 1.9 SITE ASSESSMENT

- .1 Conduct a thorough Site assessment to determine areas of concern from an Indoor Air Quality management perspective. Implement IAQ Management measures and document with the appropriate IAQ Management Schedules.

### 1.10 VOC – PRODUCTS AND MATERIALS IDENTIFICATION – REFER TO SCHEDULE A (SECTION 01 35 90.1- Indoor Air Quality Management Schedules)

- .1 The *Contractor* shall provide a list of adhesives, sealants, paints, coatings, carpeting, wood composite, and laminate materials and products that shall be installed within the building vapour barrier, including total quantity in Litres (L)
- .2 The *Contractor* shall provide documentation such as Safety Data Sheet (SDS) or other product literature that clearly states the amount of VOC's in grams per L for adhesives, sealants, paints, and coatings.
- .3 The *Contractor* shall provide documentation from the manufacturer stating the carpet product(s) complies with the Carpet and Rug Institute's Green Label Testing Program.
- .4 The *Contractor* shall provide documentation from the manufacturer for all composite wood and agrifibre *Products* that states they do not contain resins with any added urea-formaldehyde. For laminate *Products*, the *Contractor* shall submit documentation stating the laminate adhesive(s) does not contain urea-formaldehyde.

### 1.11 SOURCES OF POLLUTANTS – REFER TO SCHEDULE B (SECTION 01 35 90.1- Indoor Air Quality Management Schedules)

- .1 Any construction activity that produces odour and/or dust is considered a source of air pollutants. Typical sources of pollutants include:
- .1 Disturbing materials during demolition, repair or construction.
- .2 Materials that produce detectable odour.
- .3 Materials that create dust.
- .4 Equipment that emits products of combustion or creates odour and/or dust.
- .5 Construction activities that disrupt pollutants that have settled.
- .2 Possible sources of pollutants include:

BUILDING MATERIALS	Concrete Drywall Engineered Wood Products Cove Base	Epoxy Flooring Roofing Insulation Ceiling Tiles
WET PRODUCTS	Paint and Stains Sealants and Coatings Adhesives Acid Finish	Glazing Caulking Grouting
FURNISHINGS	Carpeting Wood Flooring Furniture	Wall Coverings Cabinets Partitions
SOLUTIONS	Solvents Cleaning Products	Fuels Pesticides

GASOLINE/DIESEL POWERED	Generators Compressors	Heavy Equipment Vehicles
LPG AND OTHER GASES	Portable Heaters Cutting Torch	Welder Soldering Gun
OTHER SOURCES	Standing water/moisture causing mould growth Tobacco smoking within the building Exterior work adjacent to building openings	

- .1 List all potential sources of indoor air pollutants on the construction site. Refer to Source Control Plan – Schedule B.
- .2 Do not permit smoking inside the building where porous materials are installed (drywall, ceiling tiles, carpet, etc.).
- .3 Do not burn garbage.
- .4 Do not fuel equipment inside the building.
- .5 Do not store gasoline or solvents inside the building.
- .6 Do not allow lubricants to spill within the building (e.g. pipe threading oil).
- .7 Promptly clean all spills (fuels, lubricants, paints, adhesives, etc.).
- .8 Restrict outdoor vehicular/equipment traffic and operation where emissions can be drawn into building.
- .9 Reduce on-*Site* emissions by using equipment that burns propane/natural gas instead of gasoline. Electric equipment eliminates combustion emissions.
- .10 Exhaust pollution sources directly to the outside using temporary or permanent ventilation equipment (refer to HVAC Protection Measures).
- .11 Where exhaust is not feasible and ventilation is required, locally re-circulate air through a portable air cleaner.
- .12 Collect and bag sawdust from woodworking tools.
- .13 Cover and/or seal all indoor sources of odour and dust.
- .14 Use painting techniques that minimize odour (roller instead of spraying)
- .15 Use cleaning practices that minimize dust (vacuum with High efficiency particulate air - HEPA filtered vacuum cleaners instead of sweeping).
- .16 Use cleaning products that minimize pollution, fumes, VOC's, chemicals.

#### **1.12 IAQ POLLUTANT CONTAINMENT MEASURES - REFER TO SCHEDULE C (SECTION 01 35 90.1- Indoor Air Quality Management Schedules)**

- .1 Prevent the movement of pollutants from the source to other areas in the building as follows:
  - .1 Erect dust curtains/doors/barriers
  - .2 Use portable fans to exhaust pollutants (e.g. gas engine exhaust) to the exterior through windows, doors, etc. Ensure that other windows or doors will not let pollutants back into building.

- .3 Close windows and doors close to exterior work - do not allow exterior pollutants to enter the building (dust, vehicle emissions, etc.). If windows and doors are not yet installed, temporarily seal openings with plastic, wood, etc.
- .4 Move equipment or pollutant-causing work to locations where IAQ impact is minimized:
  - .1 Avoid high draft or large open areas
  - .2 Use shields and curtains to contain work
  - .3 Locate in small, contained areas
  - .4 Locate outside the building
  - .5 Depressurize the work area using temporary or permanent ventilation equipment (refer to HVAC Protection Measures).
  - .6 Pressurize occupied or completed areas using temporary or permanent ventilation equipment (refer to HVAC Protection Measures).

**1.13 HOUSEKEEPING MEASURES - REFER TO SCHEDULE D (SECTION 01 35 90.1- Indoor Air Quality Management Schedules)**

- .1 Clean frequently to collect dust.
- .2 Minimize creation of dust during cleaning by using wetting agents, sweeping compounds, damp rags, wet mop.
- .3 Use vacuum equipment with HEPA filtration and/or a wet scrubber.
- .4 Clean spills promptly.
- .5 Clean or remove excess application of solvent-containing products.
- .6 Remove accumulated water and keep the building interior as dry as possible.
- .7 Close windows and doors close to exterior moisture or provide temporary enclosures of plastic or wood.
- .8 Use ventilation/dehumidification to reduce interior humidity if necessary.
- .9 Cover, seal and protect materials stored and installed on-*Site* from moisture, dust and dirt accumulation.
- .10 Shall not install any materials with evidence of moisture damage or excessive moisture content.
- .11 Shall not place materials directly on the ground. Always elevate materials off the ground to protect from moisture and dirt.

**1.14 SCHEDULING MEASURES - REFER TO SCHEDULE E (SECTION 01 35 90.1 Indoor Air Quality Management Schedules)**

- .1 Schedule construction activities to reduce absorption of VOC's, odours and fumes by porous materials.
- .2 Complete applications of wet and odorous materials such as paints, sealants, and coatings before installing absorbent materials such as ceiling tiles, carpets, and fabric-covered furnishings.
- .3 Allow for Testing, Adjusting and Balancing to be carried out following construction and before occupancy (refer to HVAC Protection Measures).

- .4 Allow for corrective work related to general deficiencies, Testing, Adjusting and Balancing, and Commissioning to be carried out following construction and before occupancy.

#### **1.15 HVAC PROTECTION MEASURES - REFER TO SCHEDULE F (SECTION 01 35 90.1- Indoor Air Quality Management Schedules)**

##### **.1 General**

- .1 Protect all HVAC equipment and ductwork from collecting dust, water and odours.
  - .2 Protect acoustic lining, and insulation as well as pre-lined and insulated ductwork from moisture accumulation and damage. This applies both to stored material and installed systems.
  - .3 Cover all equipment and stockpiled ducts and fittings with plastic during construction. Close and cover all hatches and access doors when the equipment is not being worked on.
  - .4 Shall not use the mechanical room to store or collect construction waste materials.
  - .5 Install ceiling tiles prior to final cleaning to prevent dust accumulation in ceiling plenum.
  - .6 HVAC protection measures will be reviewed by the *Consultant* during each *Site* visit.
  - .7 Correct HVAC protection deficiencies identified by the *Consultant* within 48 hours of notification.
  - .8 Clean or replace any equipment or material that is incorrectly stored or improperly protected at no extra cost to the *Owner*.
  - .9 Minimum Air filter MERV 8 (minimum efficiency reporting value) ratings shall be determined by ASHRAE 52.2-2007.
- .2 Select either 'OPTION 1' or 'OPTION 2' for each ventilation system.
- .3 **OPTION 1 - Ventilation Equipment NOT Used During Construction (RECOMMENDED):** If the *Contractor* does not operate ventilation equipment during construction the following measures **MUST** be implemented at the *Contractor's* expense.
- .1 Shall not operate any permanent HVAC equipment or systems during construction.
  - .2 Seal all openings into the HVAC systems with plastic. While ductwork installation is proceeding, seal all duct openings (open ends) that are not under immediate work. As ductwork installation is completed, seal all supply, return and exhaust openings.
  - .3 Seal all equipment openings (inlets and outlets on air handlers, fans, Variable Air Volume (VAV) boxes, etc.) with plastic until ductwork is connected. Seal ductwork as described in subsection 1.15.3.2 above.
  - .4 For ceiling plenums, install ceilings and seal all openings into plenum with plastic.
  - .5 If the HVAC system protection measures do not meet this *Specification* or if the system is operated during construction, the *Contractor* shall provide duct cleaning, plus all necessary access doors, at no extra cost to the *Owner*.
  - .6 When all construction work is complete:
    - .1 Remove plastic from system openings.

- .2 Install new filters with a MERV = 13 (or higher) in all air handling equipment (package and built-up equipment). Coordinate with the filtration requirements of mechanical specifications.
- .3 Start-up systems.
- .4 Prepare systems for Testing, Adjusting and Balancing Contractor and Commissioning Agent.
- .4 OPTION 2 - Ventilation Equipment Used During Construction: If intended to operate any ventilation equipment during construction the following measures must be implemented at the *Contractor's* expense.
  - .1 Install filters with a MERV = 13 (or higher) in all air handling equipment. Filter requirements apply to package and built-up equipment for re-circulating and 100% outdoor air systems. *Provide* a duct-mounted filter (external to equipment) if necessary.
  - .2 Install filters with a MERV = 8 (or higher) at all return/exhaust grilles. If return/exhaust grilles are not specified with filters, provide temporary filters as required. (Filter requirements apply to all system types: re-circulating, 100% outside air, and exhaust-only.)
  - .3 MERV 13 and MERV 8 filters must be installed before any system is operated.
  - .4 Temporarily shut down the return/exhaust side of the system during heavy construction/demolition.
  - .5 Permanently close off the return/exhaust side of the system in areas with high dust levels. Cover duct openings with plastic in these areas.
  - .6 If the HVAC system is operated during construction without proper protection (as outlined in this *Specification*) the *Contractor* must provide duct cleaning, plus all necessary access doors, at no extra cost to the *Owner*.
  - .7 When all construction *Work* is complete:
    - .1 Install new filters with a MERV = 13 (or higher) in all air handling equipment (package and built-up equipment). Coordinate with the filtration requirements of the mechanical *Specifications*.
    - .2 Remove all temporary filters at grilles.
    - .3 Prepare systems for Testing, Adjusting and Balancing Contractor and Commissioning Agent.

#### 1.16 IAQ TESTING

- .1 The *Contractor* to conduct baseline indoor air quality testing prior to occupancy as per EQc3.2: Construction IAQ Management Plan: Testing Before Occupancy - Option 3: IAQ Testing Prior to Occupancy in accordance EPA Protocol for Environmental Requirements Testing for Indoor Air Quality Baseline (EPA/600/4-90-010)
  - .1 IAQ Testing Preparation:
    - .1 Prior to IAQ testing, complete dust and odour generating activities including but not limited to:
      - .1 cutting.

- .2 sanding.
- .3 painting.
- .4 staining.
- .5 sealing.
- .6 caulking.
- .7 sweeping.
- .8 furniture and fixture installation under the *Contract*.
- .2 Complete a full clean of *Project* interior including but not limited to:
  - .1 vacuuming carpet.
  - .2 cleaning exposed surfaces with low-emitting GreenSeal, EcoLogo and/or soap and water solutions. No chlorinated products are permitted.
- .3 Flushout
  - .1 Prior to IAQ Testing; provide a minimum 24hr building flush-out while maintaining a temperature of at least 16C (60 °F) where mechanical cooling is operated and with a relative humidity no higher than 60%.
  - .2 Allow for Testing, Adjusting and Balancing to be carried out before the building flush-out begins.
  - .3 All corrective work related to general deficiencies, Testing, Adjusting and Balancing, and Commissioning must be completed prior to flush-out to prevent recontamination.
  - .4 At the beginning of the building flush-out verify that all permanent air filters meet the MERV specification (Refer to HVAC Protection Measures).
  - .5 During the flush-out, operate all systems at 100% outdoor air.
- .2 IAQ Testing Deficiencies:
  - .1 In the event IAQ test results exceed EPA/600/4-90-010 contaminant limits, the *Contractor* shall be responsible for taking remedial action as recommended by the *Consultant* and for scheduling and repeating procedure until requirements have been met.
  - .2 Carry out any addition work, cleaning and re-testing at no cost to the *Owner*.

#### **1.17 INSTALLATION OF PRODUCTS**

- .1 All filters, plastic and other protection measures shall be properly installed, and installation shall be reviewed by *Consultant* to ensure compliance.

#### **1.18 REMOVAL OF PRODUCTS**

- .1 All *Products* installed, as a part of the indoor air quality program's temporary measures shall be removed prior to building turnover. Any remedial work required as a result of removing the control measures shall be the responsibility of the *Contractor*.

### **PART 2 - PRODUCTS**

Not Applicable.



**PART 3- EXECUTION**

Not Applicable.

**END OF SECTION**

**VOC – Products & Materials Identification – Schedule A**

Item No.	Specification Section	Assembly /Material	Product	VOC [g/L]	Amount Used [L]	Documentation Included
Example	09 25 00	Gypsum Compound	Drywall Compound	2	15	<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
1						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
2						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
3						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
4						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
5						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
6						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
7						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
8						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
9						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
10						<input type="checkbox"/> MSDS <input type="checkbox"/> Datasheet <input type="checkbox"/> Letter
Authorized Official:			Signature:			
Organization:			Date:			
Role in Project:			Telephone No:			
Project Name:			Project Location:			

## Source of Pollutants - Schedule B

### Y GENERAL

- ☐ I have read and understand the intent and requirements of Section 01 35 90 – Indoor Air Quality Management as they relate to Source Control.
- ☐ I have reviewed the scope of *Work* for this *Project* and has identified the following as potential sources of indoor air pollutants during construction (provide separate tables for additional sources):

Source	Dust	Odour, VOC's	Spill Potential	Moisture Damage Potential	Gas Emissions	Smoke
Concrete						
Drywall						
Wood						
Insulation						
Paints						
Adhesives						
Duct Sealant						
Sealants						
Carpet						
Smoking						
Construction Heaters						
Vehicles						

### Y N/A

- ☐ ☐ LOW EMITTING PRODUCTS (low VOC - Volatile Organic Compounds) shall be used as specified. *Provide Product Literature* listing VOC's [g/L] (MSDS/Datasheet/Manufacturer Letter)
- ☐ ☐ Tobacco smoking shall not be permitted inside the building. (*Provide photos of signage*)
- ☐ ☐ Garbage shall not be burned on-*Site*.
- ☐ ☐ Equipment shall not be fueled-up inside the building.
- ☐ ☐ Gasoline and solvents shall not be stored inside the building. (*Provide photos of correct storage*)
- ☐ ☐ Spills shall be cleaned promptly.
- ☐ ☐ Outdoor traffic shall be restricted where emissions can be drawn into building. (*Provide photos of signage*)
- ☐ ☐ On-*Site* emissions shall be reduced by using equipment that uses propane/natural gas instead of gasoline. Electric equipment shall be used wherever possible. (*Provide photos*)
- ☐ ☐ Pollution sources shall be exhausted to the outside using temporary or permanent ventilation equipment. If HVAC systems are used, they shall be operated using 100% outdoor air to exhaust pollution. (*Provide photos*)
- ☐ ☐ Where exhaust is not feasible and ventilation is required, a portable air cleaner shall be used. (*Provide photos*)
- ☐ ☐ Sawdust from woodworking tools shall be collected and bagged regularly. (*Provide photos*)
- ☐ ☐ Indoor sources of odour and dust shall be covered/sealed. (*Provide 3 photos*)

- ☐ ☐ Painting techniques that minimize odour shall be used (rolling instead of spraying). (Provide photos)
- ☐ ☐ Cleaning practices that minimize dust shall be used (vacuuming instead of sweeping, use of wet rags). (Provide photos)
- ☐ ☐ Low toxicity cleaning solutions shall be used.

**Y PHOTOGRAPHS AND DOCUMENTATION**

- ☐ I shall provide three photographs of each applicable Source Control Measure. These photographs shall be taken on three different occasions during construction. Each photograph shall have a date and a description of the control measure depicted.

Authorized Official:	Signature:
Organization:	Date:
Role in Project:	Telephone No:
Project Name:	Project Location:

### IAQ Pollutant Containment Plan - Schedule C

#### Y N/A GENERAL

- ☐ ☐ I have read and understand the intent and requirements of Section 01 35 90 – Indoor Air Quality Management as they relate to Pathway Interruption.
- ☐ ☐ Temporary dust barriers shall be installed in the following areas: (Provide photos)

Location / Room	Location / Room	Location / Room	Location / Room

- ☐ ☐ Portable fans shall be used to exhaust pollutants to exterior through windows, doors, etc.
- ☐ ☐ Exterior openings (windows & doors) shall be sealed/closed to exterior work.
- ☐ ☐ Polluting equipment and work shall be moved to locations where IAQ impact is minimized as follows: (Provide photos)

Equipment / Work	Designated Location / Room

- ☐ ☐ Work areas shall be depressurized using temporary or permanent ventilation equipment.
- ☐ ☐ Occupied/completed areas shall be pressurized using temporary or permanent ventilation equipment.

#### Y Photographs And Documentation

- ☐ I shall provide three photographs of each applicable Pathway Interruption Measure. These photographs shall be taken on three different occasions during construction. Each photograph shall have a date and a description of the control measure depicted.

Authorized Official:	Signature:
Organization:	Date:
Role in Project:	Telephone No:
Project Name:	Project Location:

### Housekeeping Plan - Schedule D

#### Y N/A General

- ☐ ☐ I have read and understand the intent and requirements of Section 01 35 90 – Indoor Air Quality Management as they relate to Housekeeping.
- ☐ ☐ Cleaning Frequency: Cleaning shall be conducted every \_\_\_\_\_ Days.
- ☐ ☐ Wetting agents, sweeping compounds, damp rags, and wet mops shall be used to minimize dust creation during cleaning. (Provide photos)
- ☐ ☐ Vacuum equipment with HEPA filtration and/or a wet scrubber shall be used. (Provide photos)
- ☐ ☐ Spills shall be cleaned promptly.
- ☐ ☐ Excess application of solvent-containing products (adhesives, sealants, caulks, etc.) shall be cleaned/removed.
- ☐ ☐ Accumulated water shall be removed.
- ☐ ☐ Ventilation/dehumidification shall be used in high-humidity areas to remove moisture. (Provide photos)
- ☐ ☐ Materials stored and installed on-Site shall be covered, sealed and protected from moisture, dust and dirt accumulation. (Provide photos)
- ☐ ☐ Materials with evidence of moisture damage or excessive moisture content shall not be installed.
- ☐ ☐ Stored materials shall be elevated off the ground to protect from moisture and dirt. (Provide photos)

#### Y Photographs And Documentation

- ☐ I shall provide three photographs of each applicable Housekeeping Measure. These photographs shall be taken on three different occasions during construction. Each photograph shall have a date and a description of the control measure depicted.

Authorized Official:	Signature:
Organization:	Date:
Role in Project:	Telephone No:
Project Name:	Project Location:

### IAQ Source Scheduling - Schedule E

#### Y N/A General

- ☐ ☐ I have read and understand the intent and requirements of Section 01 35 90 – Indoor Air Quality Management as they relate to Scheduling.
- ☐ ☐ Construction activities shall be scheduled to reduce absorption of VOC's, odours and fumes by porous materials.
- ☐ ☐ Wet and odorous materials such as paints, sealants, and coatings shall be applied before absorbent materials such as ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings are installed.
- ☐ ☐ Testing, Adjusting and Balancing shall commence after construction is complete and before occupancy.
- ☐ ☐ Commissioning shall commence after construction is complete and before occupancy.
- ☐ ☐ Corrective work related to general deficiencies, Testing, Adjusting and Balancing, and Commissioning shall be completed before occupancy.
- ☐ ☐ Building occupancy shall not be permitted until all work is complete and final cleaning has eliminated dust and odour.

#### Y Documentation

- ☐ A copy of the construction schedule shall be provided with the IAQ Scheduling Plan.

Authorized Official:	Signature:
Organization:	Date:
Role in Project:	Telephone No:
Project Name:	Project Location:

## HVAC Protection - Schedule F

### Y N/A General

- ☐ ☐ I have read and understand the intent and requirements of the Indoor Air Quality Management Specification as they relate to HVAC Protection.
- ☐ ☐ Acoustic lining, and insulation as well as pre-lined and pre-insulated ductwork shall be protected from dust accumulation, moisture and damage. This applies both to stored and installed materials. (Provide photos)
- ☐ ☐ All equipment and stockpiled ducts and fittings shall be covered with plastic. (Provide photos)
- ☐ ☐ All hatches and access doors shall be closed/covered when the equipment is not being worked on. (Provide photos)
- ☐ ☐ The mechanical room shall not be used to store or collect construction waste materials. (Provide photos)
- ☐ ☐ Ceiling tiles shall be installed prior to final cleaning to prevent dust accumulation in ceiling plenum. (Provide photos)
- ☐ ☐ HVAC protection deficiencies shall be corrected within 48 hours of notification.
- ☐ ☐ Any equipment or materials that is soiled or damaged from incorrect storage or improper protection shall be cleaned or replaced at no extra cost to the *Owner*.

### Y N/A Ventilation Equipment NOT Used During Construction (RECOMMENDED)

- ☐ ☐ I shall NOT operate the following ventilation equipment during construction (provide a separate table for additional equipment):

Equipment (Tag)	Location	Area Served

- ☐ ☐ All openings into the HVAC systems shall be sealed with plastic. (Provide photos)
- ☐ ☐ All duct openings (open ends) that are not under immediate work shall be sealed. (Provide photos)
- ☐ ☐ As ductwork installation is completed, all supply, return and exhaust openings shall be sealed. (Provide photos)
- ☐ ☐ All equipment openings (inlets and outlets on air handlers, fans, etc.) shall be sealed with plastic until ductwork is connected. (Provide photos)
- ☐ ☐ Ceiling plenums openings shall be sealed with plastic. (Provide three photos) Failure to comply with this Section of the *Specification* shall result in duct cleaning and all associated expenses be provided at no extra cost to the *Owner*.
- ☐ ☐ When construction is complete, plastic shall be removed from all system openings.
- ☐ ☐ When construction is complete, system start-up shall be conducted, and systems shall be prepared for the Testing, Adjusting and Balancing *Subcontractor* and the Commissioning Agent.
- ☐ ☐ When construction is complete, air filters with a minimum efficiency reporting value (MERV) = 13 (or higher) shall be installed in all air handling equipment as follows (provide a separate table for additional equipment):

Equipment (Tag)	Filter Manufacturer	Filter Model	Filter MERV

## Y PHOTOGRAPHS and DOCUMENTATION



- ☐ I shall provide three photographs of each applicable HVAC Protection Control Measure.
- ☐ These photographs shall be taken on three different occasions during construction. Each photograph shall have a date and a description of the control measure depicted.

Authorized Official:	Signature:
Organization:	Date:
Role in Project:	Telephone No:
Project Name:	Project Location:

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including Sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 REQUIREMENTS
- 1.4 REFERENCES TO REGULATORY REQUIREMENTS
- 1.5 PRECEDENCE
- 1.6 CODES
- 1.7 INDUSTRY STANDARDS

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

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

- 3.1 APPLICABLE LAWS, ORDINANCES AND REGULATIONS

### **1.3 REQUIREMENTS**

- .1 This Section includes regulatory requirements applicable to the *Contract Documents* and the Project and *Work*. This Section shall cover the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.
- .2 The applicable edition of all codes shall be that currently adopted at the time of issuance of permits by the Authority Having Jurisdiction and shall include all modifications and additions adopted by that authority.
- .3 The applicable date of laws and ordinances shall be that of the date of performance of the Work affected by such laws and ordinances.
- .4 Specific reference in the Specifications to codes and regulations or to requirements of regulatory agencies shall mean the latest edition of each adopted by the regulatory agency in effect at the time of issuance of permits.
- .5 All materials, installation, and construction shall comply with the applicable provisions of current laws, codes, safety rules, and regulations of local, federal and any other applicable authorities ("Codes").
- .6 Codes referenced in the Contract Documents shall have full force and effect as though set out in full in these Specifications. Nothing in the Contract shall be construed to permit Work not conforming to applicable Code requirements.
- .7 The Codes and other authorities referenced in the Contract Documents are not a comprehensive list of all Codes applicable to the Work; the Codes listed in the Contract Documents are referenced for the information and convenience of the Contractor only. The Consultant does not represent that all Codes applicable to the Work have been cited or adequately described in the

Contract Documents. Contractor is solely responsible for compliance with all Codes applicable to the Work and relevant to the Contractor's means and methods of performing said Work.

## **1.4 REFERENCES TO REGULATORY REQUIREMENTS**

- .1 General:
  - .1 References to codes, standards or regulatory requirements made on Drawings or in Specifications are considered an integral part of Contract Documents as minimum requirements.
  - .2 All statutes, ordinances, laws, rules, codes, regulations, standards, and lawful orders of all public Authorities Have Jurisdiction of the Work, are hereby incorporated into these Contract Documents as if repeated in full herein and are intended to be included in any reference to Code or Building Code, unless otherwise specified, including, without limitation, the references below.
  - .3 Referenced Codes, laws, ordinances, rules and regulations shall have full force and effect as though printed in full in these Specifications. Contractor is assumed to be and shall be familiar with these requirements, including having readily available access to these requirements.
  - .4 References on the Drawings or in the Specifications to "code", "Code" or "building code" similar terms, not otherwise identified, shall mean the codes specified above, together with all additions, amendments, changes, and interpretations adopted by code Authorities of the Jurisdiction having authority over the Project.
  - .5 Contractor shall conform to all applicable federal, provincial, and local codes, laws, ordinances, rules and regulations, whether or not referenced in the Contract Documents. Compliance with applicable regulatory requirements is the responsibility of the Contractor.

## **1.5 PRECEDENCE**

- .1 Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements shall take precedence with no change in Contract Price or Contract Time.
- .2 Where Contract Documents require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, Contract Documents shall take precedence.
- .3 Where no requirements are identified on Contract Documents, comply with all requirements of applicable codes, ordinances and standards of governing Authorities Have Jurisdiction.

## **1.6 CODES**

- .1 Applicable Codes:
  - .1 The codes that apply to this Project include, but are not limited to, the currently adopted editions. Comply with Codes in effect at the time of issuance of permits.
- .2 Application of the Codes:
  - .1 Whenever there is a conflict between general and specific requirements in the code, the specific requirements shall be followed.
  - .2 Where differences exist between codes affecting this Work, the code affording the greatest protection shall govern.

- .3 Where codes other than those listed in this Section are referred to in the different sections of the Specifications, it is understood that they apply fully as if cited herein.
- .4 All Work performed shall be in accordance with applicable codes; a copy of each shall be kept at the Place of Work.
- .5 If Contractor observes that the drawings and Specifications are at variance with the codes, he or she shall notify the consultant, in writing, at once.

## **1.7 INDUSTRY STANDARDS**

- .1 Application:
  - .1 The industry standards applicable to the Work are indicated in appropriate individual sections of these Specifications, either by their names and the names of the trade associations, government agencies or other producers of standards, or by well recognized abbreviations thereof:
    - .1 Refer questions on the meaning of abbreviated designations to the Consultant for clarification before proceeding with Work affected thereby.
    - .2 Comply with standards in effect at the date of these Contract Documents, except where a standard or specific date or edition is indicated.
  - .2 Any material specified by reference to the number, symbol, or title of a specific standard, such as Commercial Standard, Federal Specifications, a trade association standard, or other similar standard, shall comply with the requirements in the latest revision thereof and any amendments or supplements thereto in effect on the date of Contract Documents.
  - .3 The standard referred to, except as modified in the Contract Documents, shall have full force and effect as though printed in these Specifications.
  - .4 These standards are not furnished to Contractor since manufacturers and trades involved are assumed to be familiar with their requirements. Where copies of standards are needed for proper performance of the Work, the Contractor shall obtain such copies which shall be maintained at the Place of Work by the Contractor and made available for review on request by the Consultant
  - .5 Where referenced Standard specifications require weather protection, it shall be provided by the Contractor at no additional cost to the Owner and shall be deemed necessary in order to construct the Project within the specified time period.

## **PART 2 - PRODUCTS**

Not applicable.

## **PART 3 - EXECUTION**

### **3.1 APPLICABLE LAWS, ORDINANCES AND REGULATIONS**

- .1 Work shall be accomplished in conformance with all applicable laws, ordinances, rules and regulations of federal, provincial, and local governmental agencies and jurisdictions having authority over the Project.
- .2 Work shall be accomplished in conformance with all rules and regulations of public utilities and utility districts.

- .3 Where such laws, ordinances, rules and regulations require more care or greater time to accomplish Work, or require better quality, higher standards or greater size of products, Work shall be accomplished in conformance to such requirements with no change to the Contract Time and Contract Price, except where changes in laws, ordinances, rules and regulations occur subsequent to time of issuance of permits.
- .4 No Change Order shall be considered for any change in any applicable federal, provincial, or local code or regulation if similar language existed in an alternate applicable regulation in force at the time of issuance of permits.
- .5 Contractor shall not allow design or construction of any conditions wherein the finished Work will not comply with current applicable codes. No Change Order shall be considered for the Work correction of any Work not complying with code.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

#### **1.1 GENERAL INSTRUCTIONS**

#### **1.2 SECTION INCLUDES**

#### **1.3 ABBREVIATIONS**

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

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

### **1.3 ABBREVIATIONS**

- .1 When the following abbreviations are used in the Contract Documents, they have the meaning listed:

<b>A</b>	
&	And
@	At
A	Ampere
AA	Aluminum Association
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturer's Association
AASHO	American Association of State Highway Officials
ABS	Acrylonitrile Butadiene Styrene
AC	Alternating Current
ACG	AABC Commissioning Group
ACI	American Concrete Institute
ACME	Association of Consulting Management Engineers
ACT	Acoustic Ceiling Tile
ACR	Air Conditioning and Refrigeration Field Services
ADA	Americans with Disabilities Act
ADC	Air Distribution and Control
AFF	Above Finish Floor
AFUE	Annual Fuel Utilization Efficiency
AG	Above Grade
AGA	American Gas Association
AHC	Architectural Hardware Consultant
AHJ	Authorities Having Jurisdiction
AHRI	Air Conditioning, Heating & Refrigeration Institute
AHU	Air Handling Unit
AIA	American Institute of Architects

AIEE	American Institute of Electrical Engineers
AIMA	Acoustical & Insulating Material Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AJT	UL Class J Time Delay Fuse
AL	Aluminum
ALUM	Aluminum
AMACF	Advanced Main Air Circulating Fan
AMCA	Air Moving and Conditioning Association Inc.
ANSI	American National Standards Institute
AODA	Accessibility for Ontarians with Disabilities Act
AP	Aluminum Panel
API	Atmospheric Pressure Ionization
ARCH	Architectural
ARI	Air-Conditioning, Heating, and Refrigeration Institute
ASC	Application Specific Controllers
ASHRAE	American Society of Heating Refrigerating and Conditioning Engineers
ASL	Above Sea Level
ASME	American Society of Mechanical Engineers
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
ATC	Acoustic Tile Ceiling
ATS	Automatic Transfer Switch
AUTO	Automatic
AWG	American Wire Gauge
AWI	Architectural Woodwork Institute (USA)
AWMAC	Architectural Woodwork Manufacturers Association of Canada
AWS	American Welding Society
AWWA	American Water Works Association

## **B**

BO	Bottom Of
B/W	Between
B-AAC	BACnet Advanced Application Controller
BAB	Roof Anchor - Bolt Around Beam
BACnet	Building Automation and Control networks
BAS	Building Automation System
B-ASC	BACnet MS/TP Advanced Application Controller
B-AWS	BACnet Advanced Operator Workstation
BBMD	BACnet/IP Broadcast Management Device
BCup	Copper-Phosphorous Brazing Alloy
BD	Board
BF	Barrier Free
BFPB	Barrier-Free Push Button

BFDO	Barrier-Free Door Operator
BHMA	Builders Hardware Manufacturers Association
BIT	Bituminous
BL or BLK	Block
BLDG	Building
BLKG	Blocking
BMS	Building Management System
BN	Bullnose
B-OD	BACnet Operator Display
B-OWS	BACnet Operator Workstation
BS	Black-Out Window Shade
BTL	BACnet Testing Laboratory
BTU	British thermal unit
BX	Flexible Metal Conduit cable
<b>C</b>	
C.B.U	Concrete Block Unit
C.L.	Centerline
C.M.U	Concrete Masonry Unit
C.W.	Curtain Wall
C/W	Complete With
CA	Commissioning Agent
CA ITEM	Cash Allowance Item
CAB	Cabinet
CaGBC	Canada Green Building Council
CATV	Cable Television
CBD	Cement Board
CCA	Canadian Construction Association
CCMC	Canadian Construction Materials Centre
CCRC	Canadian Code for Residential Construction
CCT	Correlated Color Temperature
CCTV	Closed Circuit Television
CEC	Canadian Electrical Code
CEMA	Canadian Electrical Manufacturers Association
CFC	Chlorofluorocarbon
CFM	Cubic feet per minute
CFMA	Construction Financial Management Association
CFUA	Canadian Fire Underwriters Association
CG	Corner Guard
CGA	Canadian Gas Association
CGL	Commercial General Liability
CGSB	Canadian General Standards
CH	Coat Hook
CHAN	Channel



CIQS	Canadian Institute of Quantity
CISC	Canadian Institute of Steel Construction
CISPI	Cast Iron Soil Pipe Institute
CITC	Canadian Institute of Timber Construction
CK	Caulk
CL	Closet
CLA	Canadian Lumbermen's Association
CLG	Ceiling
cm	Centimeter
CMHC	Canada Mortgage and Housing Corporation
CNTR	Counter
CO	Carbon Monoxide
COFI	Council of Forest Industries of British Columbia
COL.	Column
CONC	Concrete
CONST	Construction
CONT	Continuous
CONTR	Contractor
CORR	Corridor
COV	Change of Value
CP	Cap Screw
CPCI	Canadian Pre-stressed Concrete Institute
CPMA	Canadian Paint Manufacturers Association
CPT	Carpet
CPTB	Carpet Base
CPVC	Chlorinated polyvinyl chloride
CR	Card Reader
CRCA	Canadian Roofing Contractors Association
CRN	Canadian Registration Number
CRS	Course
CSA	Canadian Standards Association
CSC	Construction Specifications of Canada
CSI	Construction Specifications Institute (USA)
CSPI	Corrugated Steel Pipe Institute
CSR	Vibro-Acoustics Restrained Spring
CSSBI	Canadian Sheet Steel Building Institute
CT	Ceramic Floor Tile
CTB	Ceramic Tile Base
CUA	Canadian Underwriter's Association
cUL	Canadian Underwriters Laboratories
CWB	Canadian Welding Bureau
CWC	Canadian Wood Council
CWP	Cold Working Pressure
CWS	Canada-Wide Standard
CWT	Ceramic Wall Tile

Cx	Commissioning
CYL	Cylinder Lock

**D**

D.F	Drinking Fountain
D.O	Door Operator
DB	Dry-bulb temperature
dB	Decibel
dBA	Decibel A-weighting
DC	Door Contact
DDC	Direct Digital Control
DET	Detail
DFO	Department of Fisheries and Oceans
DFT	Dry Film Thickness
DHI	Door Hardware Institute
DIA	Diameter
DIM	Dimension
DIN	Deutsches Institut fur Normung
DIVS.	Divisions
DN	Down
DND	Department of National Defense, Canada
DR	Door
DS	Downspout
DWG	Drawing
DWGS	Drawings
DWR	Drawer
DWV	Drain, Waste and Vent
DX	Direct Expansion

**E**

E	East
E.W	Each Way
ECM	Electronic Control Module
ED	Exit Device
EDC	Electronic Door Contact
EDO	Electronic Door Operator
EDS	Electronic Door Strike
EEMAC	Electrical Equipment Manufacturers Association of Canada
EFT	Electrical Fast Transient
EGSA	Electrical Generating Systems Association
EHO	Electronic Hold Open
EIA	Electronic Industries Alliance
EJ	Expansion Joint
EL	Elevation

ELECT	Electrical
ELEV	Elevator
EMC	Electromagnetic compatibility
EMER	Emergency
EMI	Electromagnetic interference
EMS	Electric Motor Starter
EMT	Electrical Metallic Tubing (Conduit)
ENCL	Enclosure
ENTR	Entrance, Entry
EP	Epoxy Paint
EPA	Environmental Protection Agency
EPDM	Ethylene Propylene Diene Monomer rubber
EPX	Epoxy Flooring
EQ	Equal
EQUIP	Equipment
ERV	Energy Recovery Ventilator
ES	Electric Strike
ESA	Electrical Safety Authority
ESD	Electro Static Discharge
EW	Eye Wash
EX or EXIST	Existing
EXP	Exposed
EXT	Exterior

## F

F.A	Fire Alarm
FACP	Fire Alarm Control Panel
FAPS	Fire Alarm Pull Station
FCC	Federal Communications Commission
FCU	Fan Coil Unit
FD	Floor Drain
FDC	Fire Department Connection
FDN	Foundation
FE	Fire Extinguisher
FEC	Fire Extinguisher Cabinet
FF	Factory Finished
FH	Rating Fire & Hose
FHC	Fire Hose Cabinet
FIN	Finish
FLR	Floor
FM	Factory Mutual
FPM	Feet per minute
FR	Fire Retardant
FRR	Fire Resistance Rating
FRS	Fire Route Sign

FS	Folding Seat
FT	Feet, Foot
FT	Foot
FTG	Footing

## G

g/L	Grams Per Liter
GA	Gauge
GALV	Galvanized
GANA	Glass Association of North America
GB	Grab Bar
GFI	Ground Fault Interrupter
GFCI	Ground Fault Circuit Interrupter
GL	Glazing
GND	Ground
GPM	Gallons Per Minute
GR	Grade
GWB	Gypsum Wall Board
GWB-AR	Gypsum Wall Board-Abuse Resistant (Inherently MR As Well)
GWB-MR	Gypsum Wall Board-Moisture Resistant
GWMP	Ground Water Management Plan
GYP	Gypsum Board

## H

HB	Hose Bib
HCFC	Hydrochlorofluorocarbons
HD	Hand Dryer
HDA	Heavy Duty Asphalt
HDF	High Density Fiberboard
HDPE	High Density Polyethylene
HDW	Hardware
HDWD	Hardwood
HLR	Horizontal Lifeline Fall Protection System - Roof Mounted
HLW	Horizontal Lifeline Fall Protection System - Wall Mounted
HM	Hollow Metal
HMP	Hollow Metal Panel
HOA	Hand-Off-Automatic
HOC	Hold Open Close
HOD	Hold Open Device
HORIZ	Horizontal
HP	Horse Power
HR	Hour
HRC	High Rupturing Capacity
HRD	Hair Dryer
HS	Hardware Schedule

HSN	Hub and Spigot No-hub (see ASTM C564)
HSP	Hose Standpipe
HSS	Hollow Steel Selection
HT	Height
HV	High Voltage
HVAC	Heating, Ventilation, and Air Conditioning
HW	Hot Water
Hz	Hertz

## I

IAP	Insulated Aluminum Panel
IAPMO	International Association of Plumbing and Mechanical Officials
IAQ	Indoor Air Quality
IC	Intumescent Coatings
ICD	Implantable Cardioverter-defibrillator
ID	Identification
IDIA	Inside Diameter
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society of North America
IFB	Impregnated Fibre Board
IG	Insulating Glass
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Association
IGMAC	Insulated Glass Manufacturers Association of Canada
IN	Inch, Inches
INFO	Information
INSUL	Insulated
INSUL	Insulation
INT	Interior
I/O	Input/Output
IP	Internet Protocol
ISO	International Organization for Standardization
IT	Infrastructure Technology

## J

JC	Janitor Closet
JT	Joint

## K

kA	kiloampere
KHz	kilohertz
KP	Kick Plate
kPa	kilopascal
KPD	Key Pad

Kph	kilometers per hour
KVA	kilovolt amps
KVAR	kilovolt-amperes reactive
kW	kilowatt
kwh	kilowatt-hour
KWS	kilowatt-second

## **L**

L.F	Linear Foot
L.H	Left Hand
l/s	Liters Per Second
LAM	Laminate
LAN	Local Area Network
LAV	Lavatory
LCD	Liquid Crystal Display
LDA	Light Duty Asphalt
LED	Light-Emitting Diode
LINO	Linoleum
LKR	Locker
LNT	Lintel
LP	Low Point
LPM	Liters Per Minute
LRG	Large
LSRCA	Lake Simcoe And Region Conservation Authority
LTIC	Laminated Timber Institute of Canada
LV	Low Voltage
LVL	Level
LVR	Louver
LVR.O	Louver Opening
LVT	Low Voltage thermostat

## **M**

M	Meter
M.O	Masonry Opening
m/s	Meter Per Second
mA	Milli-Ampere
MAINT	Maintenance
MAS	Masonry
MAT	Mineral Acoustic Tile
MAT'L	Material
MAX	Maximum
MCC	Motor Control Center
MCM	Thousand Circular Mils
MECH	Mechanical
MED	Medium

MERV	Minimum Efficiency Reporting Value
MFG	Manufacturing
MFR	Manufacturer
MI	Mirror
MIA	Marble Institute of America
MIN	Minimum
MIN	Minute
MISC	Miscellaneous
MM	Millimeter
MM	Millimeters
MNR	Ministry of Natural Resources
MOE	Ministry of The Environment
MP	Metal Plate
MPA	Megapascal
MPH	Miles Per Hour
MPMDD	Modified Proctor Maximum Dry Density
MS	Metal Stud
MSS	Manufacturers Standardization Society
MS/TP	Master Slave Token Passing
MSTP	Multiple Spanning Tree Protocol
MTC	Ministry of Transportation and Communications
MTC COORD	Multiple Trade Coordination Required
MTD	Mounted
MTL	Metal
mV	Millivolt
MWLLBD(L)	Murphy Wall Bed - Lateral
MWLLBD(V)	Murphy Wall Bed - Vertical

**N**

N	North
NAAMM	National Association of Architectural Metal Manufacturers (USA)
NACE	National Association of Corrosion Engineers
NAIMA	North American Insulation Manufacturers Association
NBC	National Building Code of Canada
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards (USDC)
NC	Noise Criterion
NCM	No Centre Mullion
ND	Napkin Dispenser
NDT	Non-Destructive Testing
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NFWH	Non-Freeze Wall Hydrant

NG	Natural Gas
NHLA	National Hardwood Lumber Association (USA)
NIC	Not in Contract
NLGA	National Lumber Grades Authority
NO	Number
NO/NC	Normally Open/Normally Closed
NOX	Nitrous Oxide
NPSH	Net Positive Suction Head
NPT	National Pipe Thread
NPD	Kinetics Noise Control
NRC	National Research Council
NS	Non-Slip
NTS	Not to Scale
NWWDA	National Wood Window and Door Association

## O

OAT PG	Outdoor Air Temperature Program
O&M	Operations & Maintenance
OBC	Ontario Building Code
OC	On Centre
OCIP	Owner Controlled Insurance Program
OD	Outside Diameter
ODBC	Oracle Database Connectivity
ODP	Qzone Depletion Prevention
ODS	Overhead Door Stop
OEM	Original Equipment Manufacturing
OESC	Ontario Electrical Safety Code
OFC	Ontario Fire Code
OH	Overhead
OHC	Overhead Closer
OHSA	Occupational Health and Safety Act
OPG	Opening
OPP	Opposite
OPSS	Ontario Provincial Standard Specifications
ORN	Ornamental
OSA	Outside Air
OS&Y	Outside Screw and Yoke
OWSJ	Open Web Steel Joist
OZ.	Ounce

## P

PA	Paging System
Pa	Pascal
PANIC	Rated Panic Device
PAR	Parallel



PART	Partition
PB	Push Button
PC	Precast
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PDF	Portable Document Format
PDI	Plumbing and Drainage Institute
PE	Pressure Electric (Switch)
PER	Perimeter
PERP	Perpendicular
PF	Picofarad
PH	Potential Hydrogen (Ph Unit of Measure)
PIB	Polyisobutylene
PID	Proportional Integrative Derivative
PL or PLL	Plastic Laminate
PL.	Plate
PLAM	Plastic Laminate
PLF	Platform
PNL	Panel
PNT	Paint
POL	Polished
PP	Push Plate
PR	Pair
PREFAB	Prefabricated
PREFIN	Prefinished
PREMANUF	Pre-Manufactured
PRFN	Pre-Finished
PRL	Private Lock
PROF	Profile
PRV	Pressure Reducing Valve
PSI	Pounds Per Square Inch
PSID	Pounds Per Square Inch Differential
PSIG	Pounds Per Square Inch Gauge
P/T	Pressure and Temperature
PT	Porcelain Tile
PTD	Paper Towel Dispenser
PTD/WR	Paper Towel Dispenser & Waste Receptacle
PTFE	Polytetrafluoroethylene
PTL	Push to Lock
PTTW	Permit to Take Water
PVC	Polyvinyl Chloride
PWD	Plywood

## Q

QTR. Quarter

QTY	Quantity
<b>R</b>	
R	Radius
R/A	Return Air
RA	Roof Anchor
RAT'G	Rating
RB	Resilient Base
RCA	Reinforced Concrete Apron
RCM	Removable Centre Mullion
RD	Roof Drain
REF	Reference
REQ'D	Required
RES	Residential
REX	Request to Exit
RFCI	RF-Conducted Immunity
RFI	Radio Frequency Interference
RM	Room
RMCAO	Ready mix Concrete Association of Ontario
RMS	Root Mean Square
RO	Rough Opening
RPM	Revolutions per minute
RPU	Remote page unit
R/S	
RSH	Recessed Soap Holder
RSI	R-Value (SI units)
RSL	Resilient
RWL	Rainwater Leader
<b>S</b>	
S	South
SA	Supply Air
SAE	Society of Automotive Engineers
SAT	Supply Air Temperature
SBS	Styrene Butadiene Styrene
SC(OT)	Scupper - Overflow Type
SCADA	Supervisory Control and Data Acquisition
SCHED	Schedule
SCR	Shower Curtain and Rod
SCS	Solid Core Steel
SCW	Solid Core Wood
SD	Soap Dish
SDI	Steel Deck Institute
SEAL	Sealer
SECT	Section

SEI CMM	American Software Engineering Institute Capability Maturity Model
SER	Service
SH	Shower Head
SH/C	Shower Head & Control
SHLV	Shelving
SHR	Vibro-Acoustics Spring Hangers
SIM	Similar
SM	Sheet Metal
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SND	Sanitary Napkin Dispenser
SP	Steel Plate
SPDT	Single Pole Double Throw
SPEC	Specification
SPEC'D	Specified
SPMDD	Standard Proctor Maximum Dry Density
SPS	Solid Polymer Surfacing
SPST	Single Pole Single Throw
SQ	Square
SQFT	Square Feet, Square Foot
SR/C	Shower Rod and Curtain
SS	Stainless Steel
SSK	Service Sink
SSPC	Steel Structure Painting Council
SSUR	Solid Surfacing (Material)
SSUR(IS)	Solid Surface (Material) For Island Countertops
SSUR(WS)	Solid Surface (Material) For Window Sills
ST	Stain
STA	Standard
STC	Sound Transmission Class
STD.	Station
STL	Steel
STN	Stone
STOR	Storage
STRUCT	Structural
STS	
SUSP	Suspended
SYS	System

**T**

T&G	Tongue and Groove
T/O	Top Of
TAB	Testing, Adjusting, and Balancing
TB	Thermally Broken
TBB	Tile Backer Board
TBT	Thermally Broken Threshold

TCP	Transmission Control Protocol
TEC	Thermoelectric coolers
TEL	Telephone
TEMP	Temperature
TG	Tempered Glass
TH	Threshold
THD	Total Harmonic Distortion
THRU	Through
TIA	Telecommunications Industry Association
TIAC	Thermal Insulation Association of Canada
TOD	Time of Day
TOFM	Toilet - Floor Mounted
TOS	Top of Structure
TOWM	Toilet - Wall Mounted
TPD	Toilet Paper Dispenser
TRANSP	Transparent
TRCA	Toronto and Region Conservation Authority
TS	Transition Strip
TSSA	Technical Standards & Safety Authority
TTD	Toilet Tissue Dispenser
TTH	Toilet Tissue Holder
TTMAC	Terrazzo, Tile and Marble Association of Canada
TV	Television
TVSS	Transient Voltage Surge Suppressor
TWB	Towel Bar
TWF	Through Wall Flashing
TYP	Typical

## U

UL	Underwriters Laboratories (USA)
ULC	Underwriters Laboratories Canada
UNFIN	Unfinished
UNO	Unless Noted Otherwise
UOD	Underside of Deck
UOS	Unless Otherwise Specified
UPS	Uninterruptible Power Supply
UR	Urinal
UOS	Underside of Steel
USAS	United States of America Standards Institute
USB	Universal Serial Bus
USGPM	Us Gallons Per Minute
USS	Underside of Structure
UTC	Coordinated Universal Time
UV	Ultraviolet

<b>V</b>	
V	Volts
VAC	Voltage Alternating Current
VAV	Variable Air Volume
VB	Vapour Barrier
VCT	Vinyl Composite Tile
VDC	Voltage Direct Current
VERT	Vertical
VEST	Vestibule
VFD	Variable Frequency Drive
VIF	Verify
VLAN	Virtual Local Area Network
VOC	Volatile Organic Compound
VP	Vent Pipe
<b>W</b>	
W	West
W/	With
W/O	Without
WAN	Wide Area Network
WC	Water Column
WD	Wood
WG	Wired Glass
WHI	Warnoch Hersey
WM	Wire Mesh
WO	Window Opening
WOG	Water Oil Gas
WR	Washroom
WRGBB	Water Resistant Gypsum Backing Board
WS	Wall Stop
WS	Window Shade
WSBO	Window Shade & Blackout Blind
WSIB	Workplace Safety and Insurance Board
WT	Wall Tile
WTS	Weatherstripping
WWF	Welded Wire Fabric
<b>X</b>	
XLPE	Cross-linked Polyethylene
<b>Y</b>	
YR	York Region

## PART 2 - PRODUCTS

Not Included

**PART 3- EXECUTION**

Not Included

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 RELATED REQUIREMENTS
- 1.4 INSPECTION AND TESTING
- 1.5 ACCESS TO THE WORK AND COOPERATION
- 1.6 PROCEDURES
- 1.7 DEFECTIVE WORK
- 1.8 SCHEDULING AND REPORTS
- 1.9 TEST AND MIX DESIGNS
- 1.10 MILL TESTS
- 1.11 MOCKUPS
- 1.12 EQUIPMENT AND SYSTEMS
- 1.13 MANUFACTURER'S FIELD REVIEW

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

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

### **1.3 RELATED REQUIREMENTS**

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

### **1.4 INSPECTION AND TESTING**

- .1 The *Owner* and the *Consultant* shall have access to the *Work* at all times. If part of the *Work* is in preparation at locations other than the *Place of the Work*, access shall be given to such work whenever it is in progress.
- .2 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.
- .3 The Consultant will, on behalf of Owner, appoint inspection and testing companies, representing, reporting and responsible to the Owner through the Consultant.
  - .1 Cost of inspection and testing company services will be authorized as a disbursement from Cash Allowance as specified in Section 01 21 00. Inspection and testing company shall submit monthly invoice original to Contractor for review, relating invoices to tests and inspection reports. Provide original receipts for disbursements. Invoices for inspection and testing services shall be forwarded by Contractor to Consultant for inclusion in progress payment application.
- .4 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.
- .5 Inspection and testing required by codes or ordinances, or by an authority having jurisdiction, and made by a legally constituted authority, shall be the responsibility of the Contractor and shall be paid for by the Contractor and not be paid by Owner, unless otherwise specified in the Contract Documents.
- .6 Inspection or testing performed exclusively for Contractor's convenience shall be sole responsibility of Contractor and will not be paid by Owner.
- .7 Inspection and testing shall be performed by company qualified to perform the inspections or tests specified or required.
- .8 Requirements of regulatory companies:
  - .1 Testing shall be conducted in accordance with requirements of the building code.
  - .2 Obtain certification where required by the building code and standards.
- .9 Inspection and tests 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 not requested or directed by the *Consultant*. Required inspection and testing shall be paid for by the *Contractor* and not be paid by the *Owner*, unless otherwise specified in the *Contract Documents*.
- .10 Inspection or testing performed exclusively for *Contractor's* convenience shall be the sole responsibility of the *Contractor* and will not be paid for by the *Owner*.
- .11 The inspection and testing service does not relieve the *Contractor* of its responsibility to perform regular shop and *Site* inspection, and quality control of production.
- .12 Inspection and testing services, field and laboratory testing, shall be required for, but not limited to, the following:
  - .1 Excavation, backfill and compaction; inspection and testing.
  - .2 Founding soils; inspection.
  - .3 Paving systems; inspection and testing.
  - .4 Concrete reinforcement.



- .5 Concrete.
- .6 Mortar.
- .7 Structural steel.
- .8 Steel deck.
- .9 Roofing (except metal roofing).
- .10 Building envelope.

## 1.5 ACCESS TO THE WORK AND COOPERATION

- .1 The *Contractor* shall allow the Independent Inspection and Testing Agencies access to the *Work*, wherever the *Work* is in progress, or wherever Products, materials, or equipment are stored prior to shipping, including to off-*Site* manufacturing and fabrication plants.
- .2 Provide access to the *Work* for representatives of inspection and testing companies.
- .3 *Provide* inspection company with materials and installation information as required and/or requested.
- .4 Cooperate with inspection and testing companies and give adequate notification of any changes in source of supply, additional work shifts and other proposed changes.
- .5 No *Product* nor part of the *Work* shall be installed before it is tested when a test is specified or required, nor shall work be executed where a test or inspection is required and the inspector cannot attend.
- .6 Supply labour required to assist inspection and testing company in sampling and making tests.
- .7 Repair work damaged as a result of inspection and testing work.
- .8 Cost of above labour and material shall be borne by the *Contractor*.
- .9 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.

## 1.6 PROCEDURES

- .1 The *Contractor* shall notify the appropriate agency and the *Consultant* sufficiently in advance of the requirement for tests in order that attendance arrangements can be made reasonably.
- .2 Submit samples and/or materials required for testing, as specifically requested in the *Contract Documents*. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the progress of the *Work*.
- .3 The *Contractor* shall *Provide* labour and facilities to obtain and handle samples and materials at the *Place of the Work*. *Provide* sufficient space to store and cure test samples.

## 1.7 DEFECTIVE WORK

- .1 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.

- .2 If the *Contractor* covers, or permits to be covered, work that has been designated for special tests, inspections or approvals before such tests, inspections or approvals have been made, the *Contractor* shall, if so directed by the *Consultant* uncover the work, have the inspections or tests satisfactorily completed, and make good the work. Such uncovering and making good will not be considered or approved as a change in the *Work*.
- .3 The *Consultant* may order any part of the *Work* to be examined if the *Work* is suspected not to be in accordance with the *Contract Documents*. If, upon examination, such work is found not to be in accordance with the *Contract Documents*, the *Contractor* shall correct such work and pay the cost of the examination and correction neither of which will be considered or approved as a change in the *Work*. If such work is found to be in accordance with the *Contract Documents*, the *Owner* will pay for the cost of examination and replacement as a change in the *Work* in accordance with Section 01 26 00.
- .4 Additional testing required because of changes in materials, proportions of mixes requested by the *Contractor* or *Subcontractors* as well as any extra testing of 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*.
- .5 The *Contractor* shall make good any *Subcontractor's* work damaged by such removals or re-executions at the *Contractor's* expense and promptly.
- .6 If, in the opinion of the *Consultant*, it is not expedient to correct the defective work or the work not performed in accordance with the *Contract Documents*, the *Owner* may deduct from the monies otherwise due to the *Contractor*, the difference in value between the work performed and that required in the *Contract Documents*, the amount of which shall be determined by the *Consultant*.

## 1.8 SCHEDULING AND REPORTS

- .1 Contractor shall 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.
    - .2 Amount of advance notice shall be as required by the inspection and testing company but shall be no less than 2 Working Days.
    - .3 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.

- .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.
- .2 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.
    - .5 *Provide* copies to the *Subcontractor* whose work is being inspected and/or tested, or to the manufacturer/fabricator of the material being inspected and/or tested.
  - .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.
- .3 Copies of all inspection and test reports shall be submitted as part of the Project Records Documents in accordance with Section 01 77 00.

## 1.9 TEST AND MIX DESIGNS

- .1 Furnish test results and mix designs as required by the *Contract Documents* or as may reasonably be requested by the *Consultant*.
- .2 The procedures for submittal of test results and mix designs shall be the same as those required for shop drawings in accordance with Section 01 33 00 Submittals.

- .3 Test results and mix designs are to be considered as forming part of the Project Record Documents in the same manner as shop drawings in accordance with Section 01 77 00 Project Closeout.
- .4 The costs of tests and mix designs beyond those called for in the *Contract Documents*, or beyond those required by the authorities having jurisdiction, shall be appraised by the *Consultant* and may be authorized as a change in the *Work*.
- .5 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.
- .6 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.
- .7 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).

#### 1.10 MILL TESTS

- .1 Submit mill test certificates required by the *Contract Documents*.
- .2 The procedures for submittal of mill test certificates shall be the same as those required for shop drawings in accordance with Section 01 33 00 Submittals.
- .3 Mill test certificates are to be considered as forming part of the *Project Record Documents* in the same manner as shop drawings in accordance with Section 01 77 00.

#### 1.11 MOCKUPS

- .1 The *Contractor* shall ensure that all *Subcontractors* and suppliers prepare mockups for work specifically requested in the *Contract Documents*. Any costs associated with the preparation of mockups shall be included in the *Contract Price*.
- .2 Provide field or shop erected example of work complete with specified materials and workmanship.
- .3 Construct in locations acceptable to the *Consultant* unless otherwise indicated in the *Contract Documents*.
- .4 Prepare the mockups for review by the *Consultant* with reasonable promptness and in an orderly sequence, so as not to delay the progress of the *Work*.
- .5 Failure to prepare mockups in ample time will not be considered sufficient reason for an extension of the *Contract Time*, and no claim for extension by reason of such default will be allowed.
- .6 Refer to the respective Specification Sections to determine whether the mockup may remain as part of the *Work* or must be removed.
- .7 Protect and maintain mock-ups until directed to be removed. Commence work demonstrated in mock-up only after review and acceptance of workmanship. Mock-ups may not become part of finished work, except with explicit, prior, written acceptance of Consultant.
- .8 *Work* for which a mockup is required in accordance with the *Contract Documents* shall not proceed until the required mockup has been reviewed by the *Consultant*.

- .9 Resubmit mock-ups until written acceptance is obtained from Consultant.

#### **1.12 EQUIPMENT AND SYSTEMS**

- .1 Submit testing, adjustment and balancing reports for mechanical and electrical systems as required by the *Contract Documents*, and in accordance with Divisions 21, 22, and 23 and Divisions 26, 27, and 28, as applicable.
- .2 The procedures for submittal of adjustment and balancing reports for mechanical and electrical systems shall be the same as those required for shop drawings in accordance with Section 01 33 00 Submittals.
- .3 Adjustment and balancing reports for mechanical and electrical systems are to be considered as forming part of the *Project Record Documents* in the same manner as shop drawings in accordance with Section 01 77 00 *Project Closeout*.

#### **1.13 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.
- .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 in the *Contract Documents*, manufacturer's representative shall undertake a minimum of 1 field review, 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 The *Contractor* shall ensure that the manufacturer's representative submits 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.

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

Not applicable.

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

Not applicable.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 - GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 INSTALLATION AND REMOVAL
- 1.4 TEMPORARY DRAINAGE AND DEWATERING
- 1.5 SANITARY FACILITIES
- 1.6 WATER SUPPLY
- 1.7 TEMPORARY HEATING AND VENTILATION
- 1.8 TEMPORARY POWER AND LIGHT
- 1.9 TEMPORARY TELEPHONE
- 1.10 HOISTING
- 1.11 PLANT, MACHINERY AND SCAFFOLDING
- 1.12 SITE STORAGE AND OVER LOADING
- 1.13 SITE OFFICE
- 1.14 EQUIPMENT, TOOL, AND MATERIAL STORAGE
- 1.15 CONSTRUCTION SIGN
- 1.16 HOARDING
- 1.17 WEATHER ENCLOSURES
- 1.18 DUST TIGHT SCREENS
- 1.19 PROTECTION OF BUILDING FINISHES AND EQUIPMENT
- 1.20 PROTECTION OF CONCRETE FLOORS TO REMAIN EXPOSED IN FINISHED WORK
- 1.21 WASTE MANAGEMENT
- 1.22 SNOW REMOVAL
- 1.23 CONTROL OF DUST, DEBRIS AND NOISE
- 1.24 TRAFFIC CONTROL AND ROAD MAINTENANCE
- 1.25 SECURITY
- 1.26 DESIGN AND SAFETY REQUIREMENTS FOR TEMPORARY FACILITIES
- 1.27 MOISTURE CONTROL

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

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

### **1.3 INSTALLATION AND REMOVAL**

- .1 *Provide* temporary utilities, facilities, and controls in order to execute the *Work* expeditiously.

- .2 Arrange, obtain, and pay cost for permits required for temporary facilities and controls.
- .3 Remove from the *Place of the Work* all such work after use.

#### **1.4 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*.
- .2 *Provide* temporary drainage and pumping facilities to keep excavations and the *Place of the Work* free from standing water.
- .3 Do not discharge onto adjacent properties. Do not discharge onto adjacent roadways where such discharge may interfere with the safe and normal use thereof or where catch basins do not exist.
- .4 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.
- .5 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.
- .6 Dispose of such water in a manner that will not be hazardous to public health and safety, private property, or to the *Work*.
- .7 Drainage of trenches or other excavation through storm drainage pipe will be allowed only with the express permission of the Authority Having Jurisdiction.
- .8 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.

#### **1.5 SANITARY FACILITIES**

- .1 *Provide* sufficient sanitary facilities for workers in accordance with local health authorities.
- .2 Maintain in clean condition and properly screened from public view.

#### **1.6 WATER SUPPLY**

- .1 *Provide* a continuous supply of potable water for use in the *Work*.
- .2 Arrange for connection with the appropriate utility company and pay costs for installation, maintenance, and removal.
- .3 Pay for utility charge at prevailing rates.

#### **1.7 TEMPORARY HEATING AND VENTILATION**

- .1 *Provide* and pay for temporary heating, cooling, and ventilating required for the *Work* during the construction period, 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 Construction heaters used inside buildings must be vented to the outside or be flameless type. Solid fuel salamanders are not permitted.
- .4 Maintain temperatures of minimum 10°C in areas where the *Work* is in progress, unless indicated otherwise in the specification sections.
- .5 Ventilate heated areas and keep building free of exhaust or combustion gases.
- .6 Heat shall be uniformly distributed to avoid hot or cold areas or excessive drying.
- .7 Make good any damage caused by inadequate or excessive heat. Such making good will not be considered or approved as a change in the *Work*.

#### **1.8 TEMPORARY POWER AND LIGHT**

- .1 Arrange for temporary power required during construction for the proper execution of the *Work* and the safe and proper operating of power tools. Temporary power to be in accordance with Divisions 26, 27 and 28.
- .2 Arrange for connection with the appropriate utility company. Pay costs for any required permits, for installation, maintenance, and removal.
- .3 Pay for utility charge at prevailing rates.
- .4 Abide by the rules of the Canadian Electrical Code.
- .5 Maintain in good working order throughout the course of the *Work*.

#### **1.9 TEMPORARY TELEPHONE**

- .1 *Provide* and pay for a temporary telephone, to be located in the *Site* office, and available for use by the *Owner*, *Consultant* and *Subcontractors*.
- .2 The *Contractor* shall pay all service and local use charges for the telephone, including installation and removal on completion of the *Work*. Long distance charges shall be paid to the *Contractor* by the person or company making the call.
- .3 Superintendent shall be equipped with mobile telephone device.

#### **1.10 HOISTING**

- .1 *Provide*, operate, and maintain any hoists/cranes required for moving of workers, materials and equipment.
- .2 Hoists/cranes are to be operated by a qualified operator only. Proof of operator's qualification shall be provided upon request.



#### **1.11 PLANT, MACHINERY AND SCAFFOLDING**

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

#### **1.12 SITE STORAGE AND OVER LOADING**

- .1 Confine the *Work* and the operations of workers to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with Products or construction machinery and equipment.
- .2 Do not load or permit to be loaded any part of the *Work* with a weight or force that will endanger the *Work*.
- .3 Handle and store materials so as to prevent damage or defacement to the *Work* and surrounding property.

#### **1.13 SITE OFFICE**

- .1 *Provide* a weathertight, lockable office for the use of the *Contractor*, *Subcontractors*, the *Consultant*, engineers, and the *Owner* when at the *Place of the Work*, and for the purposes of *Site* meetings.
- .2 The *Site* office shall have heat, light, and ventilation from sources as outlined above.
- .3 *Provide* a meeting table, shelving, file cabinets, and the like, suitable for the storage and review of the *Contract Documents*, shop drawings, *Change Orders*, *Supplemental Instructions*, and all other record documents as required by the *Contract Documents* and by the *Authorities Having Jurisdiction*.
- .4 The *Site* office shall not be used for the storage of Products, or construction machinery or equipment.

#### **1.14 EQUIPMENT, TOOL, AND MATERIAL STORAGE**

- .1 *Provide* and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds at the *Place of the Work* in a manner to cause the least interference with the *Work*.
- .3 Owner is not responsible for securing Products or materials at the *Place of the Work*.

#### **1.15 CONSTRUCTION SIGN**

- .1 If a painted plywood sign is supplied to the *Contractor* by the *Owner* for installation at the *Place of the Work* during the course of the *Work*, then *Contractor* is to supply and install nominal 100 mm x 100 mm wood posts and framing, and is to fix the sign to the framing.
- .2 The maximum size of the sign shall be 1200 mm x 2400 mm.

- .3 No other signs, other than for safety, caution, or instruction, will be permitted.

#### **1.16 HOARDING**

- .1 *Provide* hoarding and barricades as and where required by *Authorities Having Jurisdiction* or required to protect the public, workers, and public and private property from injury or damage.
- .2 Include for the provision of overhead protection and temporary exits and exit signs as may be required during the course of the *Work*.
- .3 Include for the provision of temporary gates and/or doors to *Provide* restricted access to the *Place of the Work* as required.

#### **1.17 WEATHER ENCLOSURES**

- .1 *Provide* weathertight closures to unfinished door and window openings, tops of shafts, and other openings in floors and roofs.
- .2 Close-off floor areas where walls are not finished, seal-off other openings, and enclose building interior work area for temporary heat.

#### **1.18 DUST TIGHT SCREENS**

- .1 *Provide* dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work, and the public.
- .2 Maintain and relocate protection until such work is complete.

#### **1.19 PROTECTION OF BUILDING FINISHES AND EQUIPMENT**

- .1 *Provide* protection for finished and partially finished building finishes and equipment during performance of the *Work*.
- .2 Protect the *Work* from damage, discolouring, and defacement. Maintain protection until the *Work* is complete.
- .3 Protect completed work from soiling, abrasion, punctures, damage, and defacement, and maintain protection until the surrounding or overhead work is complete.
- .4 Keep surfaces free of oils, grease or other materials that may damage or deface them or affect bond of applied *Products*.
- .5 Remove and replace materials damaged or defaced as a result of failure to provide adequate protection.
- .6 Have damaged or defaced work corrected by workers meeting qualification requirements of the *Contract Documents*.
- .7 *Provide* minimum 3 mm thick Masonite board protection, or finish flooring manufacturer approved alternative, to all finished floors.
- .8 The *Contractor* shall be held responsible for damage due to lack of, or improper, protection, and will be required to make good any such damage. Such making good will not be considered or approved as a change in the *Work*.

#### **1.20 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 Scissor lifts 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 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.

#### **1.21 WASTE MANAGEMENT**

- .1 Do not bury rubbish and waste materials at the *Place of the Work*.
- .2 Do not dispose of waste into waterways or storm or sanitary sewers.
- .3 Do not burn waste materials at the *Place of the Work*.
- .4 Comply with waste disposal requirements of authorities having jurisdiction.
- .5 Remove waste material from the *Place of the Work* daily. If waste is collected in bins, bins to be removed from site once full.
- .6 Arrange and pay for removal of debris and waste from the *Place of the Work*.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris. Pay fees.

#### **1.22 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*.

#### **1.23 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.

#### **1.24 TRAFFIC CONTROL AND ROAD MAINTENANCE**

- .1 Do not block roads or impede traffic. Keep construction traffic to designated roads only.
- .2 *Provide* flag person to direct traffic as required.
- .3 *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*.
- .4 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*.
- .5 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*.

#### **1.25 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* will 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.

#### **1.26 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 a Professional Engineer to design and supervise construction and maintenance of hoardings, covered ways, protective canopies, and project sign(s). Designs provided by the *Consultant* or the *Owner* for such work cover general appearance only.

#### **1.27 MOISTURE CONTROL**

- .1 Concrete slabs shall be properly cured and dried before installation of finished flooring assemblies.
  - .1 Allow for one of the following methods:
    - .1 Drying time.
    - .2 Drying action by mechanical methods.

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

## **PART 2 - PRODUCTS**

Not applicable.

## **PART 3 - EXECUTION**

Not applicable.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Quality Assurance
- .5 2.1 Materials
- .6 3.1 Examination
- .7 3.2 Tree Pruning
- .8 3.3 Tree Protection
- .9 3.4 Tree Repair and Replacement
- .10 3.5 Field Quality Control

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 This section includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the *Work*, whether temporary or permanent construction.

### **1.4 QUALITY ASSURANCE**

- .1 Qualifications: The *Contractor* shall engage an experienced tree service firm, minimum five years' experience, that has successfully completed tree protection and trimming work similar to that required for this *Project*. The *Contractor* shall ensure that the tree services firm assigns an experienced, qualified arborist to *Project* and ensures the arborist is present at the *Place of the Work* during execution of tree protection and trimming.
- .2 Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and other Woody Plant Maintenance—Standard Practices (Pruning)."

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 *Products* and remedial care for protection of the trees and plants as specified must 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* and subject to the approval by Urban Forestry Services:
  - .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 the *Consultant* if *Site* conditions will not permit completion of tree and plant protection work as in accordance with the *Contract Documents*.
- .2 No ground breaking 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 The Tree Protection Zone (TPZ) shall be posted with signs.
- .5 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 (i.e.: 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 PRUNING**

- .1 Prune trees and plants indicated to remain that are affected by temporary and permanent construction.
- .2 Prune trees to remain to compensate for root loss caused by damaging or cutting root system. *Provide* subsequent maintenance during *Contract* period as recommended by arborist.
- .3 Pruning Standards: Prune trees according to ANSI A300.
  - .1 Type of Pruning: Cleaning, Raising, and Reduction.
- .4 Cut branches with sharp pruning instruments; do not break or chop.
- .5 Chip removed tree branches and dispose of off-*Site*.

#### **3.3 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 trees to be protected shall be pruned in accordance with Tree Pruning paragraphs above in this Section.
- .6 The *Contractor* shall ensure that the arborist undertakes proper root pruning when and if roots of retained trees are to be exposed, damaged or severed by construction activities. The *Contractor* shall ensure that the arborist supervises 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.
- .7 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*.
- .8 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*.
- .9 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.
- .10 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.
- .11 Obtain necessary permits, reports, and approvals.
- .12 Proceed with execution of specified work, under direction of the *Consultant*.
- .13 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.

### 3.4 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 the *Consultant* and the arborist determine are incapable or restoring to normal growth pattern. This shall be done at no additional costs to the Owner.
  - .1 *Provide* new trees of same size and species as those being replaced; plant and maintain as specified by the *Consultant*.
  - .2 *Provide* new trees of 150 mm (6") calliper size and of a species selected by the *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 the *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.
  - .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 the *Project's* 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 – Quality Control.

**END OF SECTION**

## **1. GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Address erosion and sedimentation control related activities including but not limited to:
  - .1 Prevent loss of soil from construction site resulting from storm water runoff, wind erosion and construction activities.
  - .2 Prevent sedimentation of storm sewers and receiving waters.
  - .3 Prevent air pollution caused by dust and particulate matter.
  - .4 Meet or exceed the requirements of LEED v4 Sustainable Sites Prerequisite “Construction Activity Pollution Prevention” including creation of compliant Storm Water Pollution Prevention Plan (SWPPP).
  - .5 Implement and maintain all ESC measures shown on civil engineering drawings and described in these Specifications.
  - .6 Install ESC measures and products in accordance with manufacturer’s instructions and prescribed installation procedures in referenced ERA document.
  - .7 Inspect ESC measures on a weekly basis and following significant storm events. If deficiencies are found, make repairs within 24 hours of detection.
  - .8 Maintain an ESC inspection and photograph record to document observations, deficiencies, and corrective actions.
  - .9 Provision of waste management and disposal requirements: Section 01 74 19, Waste Management Requirements for LEED v4.

### **1.2 RELATED SECTIONS**

- .1 01 33 63 General LEED v4 Requirements
- .2 01 35 66 LEED v4 Project Management and Coordination
- .3 01 74 19 Waste Management Requirements for LEED v4
- .4 01 81 19 Indoor Air Quality Management
- .5 31 25 00 Erosion and Sedimentation Control

### **1.3 DEFINITIONS**

- .1 See Section 01 35 63 General LEED v4 Requirements
- .2 ESC: Erosion and Sedimentation Control
- .3 EPA: Environmental Protection Act.
- .4 SWPPP: Stormwater Pollution Prevention Plan
- .5 BMP: Best Management Practise(s)

#### 1.4 REFERENCES

- .1 LEED v4 Building Design and Construction Guide for New Construction, U.S. Green Building Council, Credit Library.
- .2 U.S. Environmental Protection Agency. Construction General Permit. 1992

#### 1.5 SUBMITTALS

- .1 Storm Water Pollution Prevention Plan (SWPPP): Prior to mobilization on site, submit written document detailing all applicable measures to be implemented and maintained on project site referencing ESC drawing provided by Civil Engineering Consultant, project schedule and expected weather conditions during demolition and construction activities.
  - .1 Plan to include the following for LEED compliance:
    - .1 Identify all constructors/subcontractors on the site, their scope of activities, area under their control and their expected dates of activities
  - .2 Description of the nature of the site activity, including:
    - .1 Description of the project
    - .2 The intended sequence and timing of activities that disturb soils at the site and when final stabilization of the site (or portions of) is expected;
    - .3 Expected weather and soil conditions during the scheduled site activities that could increase runoff or create dust;
    - .4 Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas;
    - .5 Expected air quality and stormwater runoff effects on adjacent sites;
    - .6 A general location map with enough detail to identify the location of the construction site and any stormwater management systems, bodies of water, waterways and wetlands within 2 kilometres of the site.
  - .3 Description of measures to address controlling discharges, stabilization and pollution prevention including:
    - .1 Provision of natural buffers
    - .2 Installation of perimeter controls
    - .3 Minimization of sediment track-out
    - .4 Minimization of dust from stockpiled soil
    - .5 Preservation of topsoil
    - .6 Minimization of soil compaction
    - .7 Protection of storm drain inlets
    - .8 Maintenance of control measures
    - .9 Deadlines and criteria for stabilization

- .10 Prohibited discharges
- .11 General maintenance requirements
- .12 Pollution prevention standards
- .13 Emergency spill notification
- .14 Fertilizer discharge restrictions
- .4 A site map identifying:
  - .1 Slope of the project site and direction(s) of storm water flow during site activities;
  - .2 Areas of soil disturbance and areas that will not be disturbed;
    - .1 Limit all site disturbance to a maximum of 12 m beyond building perimeter, 3 m beyond paved areas, 4.5 m beyond primary roadway curbs and main utility branch trenches, and 7.5 m beyond constructed area with permeable surface (permeable paving, playing fields, stormwater detention facilities)
  - .2 Locations of major structural and non-structural BMPs to be implemented;
  - .3 Construction site entrances;
  - .4 Locations of off-site material, waste, borrow or equipment storage areas;
  - .5 Locations of all natural and constructed bodies of water, waterways and wetlands within the site; and
  - .6 Locations of existing and newly implemented storm water systems to be protected.
- .5 The SWPPP must include a description of all pollution control measures (i.e. BMPs) that will be implemented as part of the construction activity to control pollutants in storm water discharges. For each major activity identified in the project description the SWPPP must clearly describe appropriate control measures, the general sequence during the construction process in which the measures will be implemented, and which the contractor is responsible for the control measure's implementation.
- .6 The SWPPP must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented. Site plans should ensure that existing vegetation is preserved where possible and that disturbed portions of the site are stabilized as soon as possible. Use of impervious surfaces for stabilization should be avoided.
- .7 The following records must be maintained as part of the SWPPP:
  - .1 Dates when major grading activities occur;
  - .2 Dates when construction activities temporarily or permanently cease on a portion of the site; and
  - .3 Dates when stabilization measures are initiated.

- .8 The SWPPP must include a description of structural practices to divert flows from exposed soils, retain/detain flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Placement of structural practices in floodplains must be avoided to the degree practicable.
  - .9 The SWPPP must include a description of all post-construction storm water management measures that will be installed during the construction process to control pollutants in storm water discharges after construction operations have been completed. Structural measures should be placed on upland soils to the degree practicable. Such measures must be designed and installed in compliance with applicable federal, local, provincial or other requirements.
  - .10 The SWPPP must describe all measures to prevent the discharge of solid materials to any stormwater management systems, waterways, bodies of water or wetlands.
  - .11 The SWPPP must describe measures to minimize off-site vehicle tracking of sediments onto paved surfaces and the generation of dust.
  - .12 The SWPPP must include a description of construction and waste materials expected to be stored on-site with updates as appropriate. The SWPPP must also include a description of controls, including storage practices, to minimize exposure of the materials to storm water, and spill prevention and response practices.
  - .13 The SWPPP must include a description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites to minimize pollutant discharges.
- .2 Site Quality Control Submittals: Submit date stamped digital photographs documenting ESC inspections to LEED consultant monthly with notes on deficiencies which were addressed.

## **2. EXECUTION**

### **2.1 INSTALLATION:**

- .1 Stabilized Construction Entrance: Construct a Stabilized Construction Entrance before construction begins at every point where traffic leaves site and enters onto a public road and/or any unpaved entrance/exit location where there is a risk of transporting mud or sediment onto paved roads. Implement sweeping at every paved entrance.
- .2 Dust Control: Apply, spray-on adhesives, calcium chloride, water sprinkling, stone, or barriers on open dry areas of soil as required to minimize dust (wind-blown erosion).

- .3 Silt Fence: Construct posts with a filter fabric media to remove sediment from storm water volumes flowing through fence around site perimeter. May also be used as a barrier to control ground levels of dust movement along small portions of the site.
- .4 Inlet Protection: Install filter fabric and straw bales, stone, concrete masonry units and stone, or silt fences around catch basins and manhole covers to prevent siltation of inlets, storm drainage systems, or receiving channels.
- .5 De-watering Filtration: Install filtration devices on the discharge end of all de-watering hoses to prevent silting of inlets, storm drainage systems, or receiving channels.
- .6 Material Stockpiling: Stabilize stockpiled material that will not be used or removed within 14 days, using one of the following measures:
  - .1 Temporary Seeding
  - .2 Tarps
  - .3 Compaction
  - .4 Surface Roughening
- .7 Concrete washout: Implement truck and equipment washout area with additional structural measures and visual inspections at designated location on the site.
- .8 Visual inspection: Inspect vehicle as they cross stabilized site entrance tires to ensure minimal levels of mud and dust on tires.

## 2.2 SITE QUALITY CONTROL

- .1 Site Tests and Inspections:
  - .1 Inspection procedures specified below summarize EPA document and shall be followed in conjunction with details, drawings and manufacturer requirements.
  - .2 Inspect ESC control measures at least once each week (unless otherwise noted) and following any significant storm event (13 mm (1/2") of precipitation or greater). Take photographs during these inspections and at fixed waypoints (as directed by LEED consultant) in order to document compliance.
    - .1 Each ESC measure must be photographed at least once weekly to demonstrate continuous compliance.

## 2.3 REMOVAL

- .1 Removal of Products: Do not remove ESC measures until final landscaping and paving is complete and soil is stabilized.

- .1 Temporary removal for landscaping activities must be limited to actual area of work and must be reinstalled immediately after work is complete until soil is stabilized (i.e. paving is complete, sod is installed, seeding has germinated).
- .2 If landscaping and paving is completed in stages, re-install measures around smaller areas that are not yet landscaped or paved or around seeded areas needing additional time to stabilize soil.

## 2.4 MAINTENANCE

- .1 Maintain ESC control measures in good working order; correct any deficiencies noted in installed control measures immediately. Ensure photographs are taken pre- and post-remediation to document corrections made to deficiencies.
- .2 Review ESC control measures with LEED consultant during each site visit.
- .3 Stabilized Construction Entrance: Apply additional large granular material as required, remove sediments and other materials from areas to minimize clogging. Keep adjacent public roadway(s) free of sediment.
- .4 Implement street sweeping if any sediment is visible on public roadways or on paved access roads.
- .5 Silt Fence: Inspect silt fence for depth of sediment, tears and loose fabric. Remove built-up sediment from silt fence when it has reached 1/3 height of fence. Repair fence to its original installation condition.
- .6 Inlet Protection: Inspect to ensure measures are in original installed condition. Ensure measures are effectively trapping sediment. Remove accumulated sediment and debris on a regular basis. Repair or replace protection measures such as filter fabric when damaged.
- .7 Dewatering Filtration: Inspect filtration device for depth of sediment. Clean and or replace the device when 1/2 full of sediment or when sediment has reduced the flow rate of the pump discharge to an impractical rate.
- .8 Material Stockpile: Inspect for effective prevention of runoff and wind erosion.
- .9 Concrete washout: Ensure maintenance of all structural measures implemented and replace as necessary. Ensure proper processes are consistently followed.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 GENERAL SUMMARY**

- .2 Section Includes
  - .1 Special requirements for Indoor Air Quality (IAQ) management during construction operations
  - .2 Startup requirements for HVAC equipment prior to occupancy
- .3 Definitions
  - .1 Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air.
  - .2 Interior finishes: Materials and products that will be exposed to the interior, occupied spaces; including flooring, wall covering, finish carpentry, and ceilings. These are all materials that are inside the Project weatherproofing system.
- .4 Reference Standards
  - .1 SMACNA - IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition, Chapter 3, November 2007

### **1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: The Contractor shall provide subcontractor orientation, including a clear delineation of responsibilities for each subcontractor required to implement the proposed IAQ Management Program.
  - .1 Include IAQ management as an agenda item to be discussed regularly at construction meetings.
- .2 Sequencing: The Contractor shall ensure that the building is fully enclosed and watertight prior to the installation of absorptive materials. Stage subcontractors to ensure that dust-generating activities are complete prior to the installation of carpets, ceiling tiles and other final finish materials.
- .3 Scheduling: As the interior finishes are being installed, and prior to equipment start-up, conduct a meeting with the Owner, Consultants, and subcontractors to discuss the proposed approach to staging of finishes, equipment starting up, and commissioning.

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 All materials and *Products* shall be inspected upon delivery to the site to ensure there is no pre-existing damage due to dust, moisture, or physical impact.
- .2 Once on the site, all materials and *Products* shall be stored according to 3.1.3.
- .3 All materials used to protect (e.g. skids, tarps, etc.) materials and *Products* shall be reused as practicable and recycled at the end of their useful life.



## 1.5 SITE CONDITIONS

- .1 The measures stipulated herein are to be implemented as required to address the specific site conditions.

## PART 2 – PRODUCTS

NOT USED

## PART 3 – EXECUTION

### 3.1 ADMINISTRATIVE REQUIREMENTS

#### .1 IAQ MEASURES AND PROCEDURES

##### .1 Source Control

- .1 Smoking is not permitted inside the building at any time. The Contractor shall post “No Smoking” signs at each entrance and throughout the building to enforce this requirement.
- .2 All toxic chemicals and fuels are to be stored outside of the building.
- .3 Keep idling trucks away from open portions of the building, outdoor air inlets, and open doorways.
- .4 All equipment refueling is to be done outside of the building.
- .5 After close-in, gas powered equipment is not permitted to be used in the building without prior approval from the Consultant. Preference will be given to electric or propane powered equipment.
- .6 All interior paints and finishes, adhesives, sealants applied onsite and used within the weatherproofing system must satisfy the requirements of corresponding specification sections.
- .7 Where practicable, assemble products and assemblies that require the use of adhesives, sealants, paints and coatings offsite (e.g. millwork).
- .8 Where practicable, allow new materials, products and assemblies to off-gas prior offsite or in a dedicated and isolated area within the building prior to installation (e.g. furniture).

##### .2 Scheduling

- .1 Weatherproof the building from the exterior environment as quickly as possible. Schedule installation of moisture-control materials, including but not limited to air barriers, flashing, exterior sealants and roofing, at the earliest possible time.
- .2 Schedule construction operations involving wet and/or odorous materials prior to installation of dry and/or absorbent materials. Install interior absorptive materials only after the building envelope is sealed and weatherproofed.
  - .1 Apply Type 1 interior finishes and allow these finishes to completely cure according to intervals and times stated in respective finish manufacturers printed instructions before commencing installation of any Type 2 materials in same area.
  - .2 Do not store any Type 2 materials in areas where installation or curing of Type 1 materials is in progress.

- .3 Where the requirements above are not possible, protect Type 2 materials with a polyethylene sheet.

Material and Finish Type	Material Examples
Type 1   Materials and finishes which have potential for short term levels of off-gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.	Type 1   Materials and finishes include, but are not limited to the following: <ul style="list-style-type: none"> <li>▪ Composite wood products, including particleboard and plywood from which millwork, wood paneling, doors or furniture may be fabricated</li> <li>▪ Adhesives, sealants and glazing compounds</li> <li>▪ Wood preservatives, wood finishes, primers and paints and paint like wall finishes</li> <li>▪ Control and/or expansion joint fillers, firestopping materials and caulking</li> <li>▪ Hard finishes requiring adhesives installation including, but not limited to plastic laminate, linoleum and rubber tile</li> <li>▪ Gypsum board and associated finish processes and products</li> </ul>
Type 2   Soft materials and finishes which are woven, fibrous, or porous in nature and may absorb chemicals off-gassed by Type 1 materials and finishes or may be adversely affected by airborne particulate. These materials have the potential to become sinks for deleterious substances which may be released much later, or act as collectors of contaminants that may promote subsequent bacterial growth.	Type 2   Materials and finishes include, but are not limited to the following: <ul style="list-style-type: none"> <li>▪ Carpet and underpadding, and other woven or fibrous floor finishes</li> <li>▪ Fabric wall coverings</li> <li>▪ Insulation materials exposed to the airstream</li> <li>▪ Acoustic ceiling materials</li> <li>▪ Furnishings with fabric coverings</li> </ul>

- .3 Once installed, protect absorbent materials including, but not limited to, porous insulations, paper-faced gypsum board, ceiling tile, and carpet from dust, dirt and moisture accumulation.
- .4 After carpet is installed, place a protective barrier, such as cardboard or plastic sheet, over all floor areas that will be travelled on by workers prior to the end of construction.
- .3 Material and Product Storage
- .1 All porous, absorptive and finish materials are to be covered or contained prior to installation to prevent dust, dirt and moisture accumulation.
- .2 While in storage, materials and products shall be elevated a minimum of 4" above the floor and covered using tarps or plastic sheets.
- .3 Materials and products that will be installed inside the weatherproofing system must be kept dry at all times. The Contractor shall identify and remove all porous building materials that become wet or damaged by moisture within 7 calendar days of such exposure.
- .4 Housekeeping Measures

- .1 Clean up accumulated debris on a daily basis.
- .2 Complete a comprehensive cleaning of the entire floor area on a weekly basis. Clean up shall include, at a minimum, the following activities:
  - .1 Removal of all unnecessary debris and waste from the building. Dispose of in accordance with the specifications.
  - .2 Vacuum (preferred) or sweep (using a non-toxic sweeping compound) all floor areas.
  - .3 Inspect storage of all materials and products for compliance with 3.1.3.
- .3 Once the building is closed-in, use walk off mats at all entryways to limit the amount of dirt that is tracked into the building.
- .4 Keep dirt and other pollutants away from outdoor air intakes and building openings.
- .5 Keep mechanical rooms clean and neat. Remove excess dust and debris.
- .6 All standing water that accumulates on interior floors shall be removed on the day that it is observed.
- .5 Pathway Interruption
  - .1 Project equipment and material staging areas shall be located away from critical airflow pathways.
  - .2 Mechanical rooms and air handling equipment areas shall not be used to store construction waste or materials.
  - .3 Use permanent or temporary barriers to isolate areas with heavy dust generating activities from the rest of the building. Used permanent walls, doors or temporary plastic sheet barriers to isolate these areas.
  - .4 Establish at least one centrally located work/cutting room that is isolated from other areas of the building using permanent or temporary barriers. Entryways into this room must be equipped with doors or dust curtains to contain dust. Carryout out all heavy dust-generating activities (e.g. wood cutting) in this room. If required, provide temporary exhaust to the outdoors as required to maintain area at a negative pressure differential compared to surrounding areas to control dust migration.
- .6 Ductwork Protection
  - .1 Stockpiled ductwork not yet installed shall be stored in an area that is clean, dry and has minimum exposure to dust. Ductwork shall be elevated a minimum of 4" above the floor and covered using tarps or plastic sheets.
  - .2 During ductwork installation, the working area shall be clean, dry and protected from the exterior elements.
  - .3 Wipe internal surfaces of ductwork immediately prior to installation to remove dust that has accumulated.
  - .4 All open ductwork must be covered at the end of each day or when not being worked on to prevent the entry of debris into the duct. This can be done using self-adhesive polyethylene or duct end caps.

#### .7 HVAC Equipment Protection

- .1 HVAC equipment not yet installed shall be stored in an area that is clean, dry and has minimum exposure to dust. Equipment shall be elevated a minimum of 4" above the floor and covered using tarps or plastic sheets.
- .2 Seal supply diffusers and return grills with plastic during construction operations. Ensure that plastic covers remain in place until final building cleaning and prior to HVAC equipment start-up.
- .3 Provide temporary exhaust to areas where heavy construction and dust generating activities are expected to take place. Exhaust systems shall be independent of the building HVAC system to minimize ductwork and equipment contamination.
- .4 HVAC equipment should not be operated during construction. If temporary heating, cooling or ventilation is required, this should be done using temporary equipment. Equipment with firing sections located outside the building (e.g. indirect furnaces) should be given preference over standard propane fired construction heaters.

Note: Should a permanent HVAC system(s) be operated during construction, its operation shall be approved by both the Consultant and Engineer. Prior to start-up, the Contractor shall place temporary filters with a MERV 8 or better effectiveness over all return grills and replace all internal equipment filters prior to start-up. If an un-ducted plenum over the construction zone must be used for return air, the Contractor shall ensure that all ceiling tiles are in place and that temporary filters with a MERV 8 or better effectiveness are placed over return grills in the suspended ceiling. Systems are to be shut down during heaviest periods of construction. Also note that all filtration media in the HVAC system(s) operated during construction must be replaced prior to occupancy.

### 3.2 HVAC EQUIPMENT STARTUP

- .1 Ventilation System: Remove the protective plastic barriers installed on the ventilation system. Visually inspect the system to ensure the ventilation system is dry and substantially free of dust and debris. Vacuum and clean as required prior to installing registers, grilles and diffusers.
- .2 Filters: Ensure new filtration media as specified in the mechanical drawings and specifications is installed prior to the operation of any equipment.
- .3 Outdoor Air Dampers: As part of the commissioning process, ensure all outdoor air dampers operate as anticipated, including mechanical range of motion, as well as confirming the control system is properly calibrated.
- .4 Drain Pans: Visually inspect all installed drain pans, under normal operation to minimize the potential for water stagnation, and the damage (i.e., mold growth) that could result from water that does not drain properly.

### 3.3 BUILDING FLUSH-OUT PRIOR TO OCCUPANCY

- .1 Ventilate the building with outside air at the highest rate and duration practical (while still maintaining ventilation requirements for outdoor air flow and humidity control) at the following times:
  - .1 During and shortly after installing products that are known sources of contaminants (e.g., cabinets, carpet padding and painting), using temporary equipment (e.g. spot fans) and,

- .2 After construction ends and prior to occupancy, using the permanent ventilation systems
  - .1 "End of construction" includes, but is not limited to, the completion of the following tasks:
    - .1 All interior finishes are installed
    - .2 All final deficiencies have been rectified
    - .3 Final cleaning is complete
    - .4 HVAC systems have been balanced and are fully functional and operational

Note: Commissioning activities are permitted during the flush-out procedures as long as they do not introduce any additional contaminants into the building.
  - .2 "Prior to occupancy" means prior to the Owner (and/or occupants) moving into and occupying the space.
  - .3 Furniture (e.g. beds and mattresses) are encouraged to be installed prior to the start of the flush-out period to help expedite the off-gassing process.
- .3 The following tasks shall be completed prior to commencing the building flush-out:
  - .1 Remove all ductwork/diffuser protection and any temporary filters present on return air inlets
  - .2 Install new filtration media (in accordance with design requirements) in all HVAC equipment that will be used to carry out the flush-out. Note that systems that deliver 100% outdoor air to the building do not need to have filters replaced.
- .4 The Flush-Out period shall last at least 14 consecutive Days, from the time "end of construction" has been reached to the date the building is to be turned over to the Owner, to carry out the building flush-out described herein. A building flush-out overlapping with occupancy will not be permitted. The Contractor shall reserve adequate time in the construction schedule to carry-out the flush-out. An internal temperature of at least 16°C and relative humidity no higher than 60% shall be maintained throughout the entire flush-out period.

### **3.4 ONSITE QUALITY CONTROL**

- .1 Site Inspections: Consultant inspections will take place intermittently throughout construction and provide feedback to the Contractor as to the status of the IAQ management.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 - GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 AVAILABILITY OF PRODUCTS
- 1.5 DELIVERY, STORAGE AND HANDLING
- 1.6 CONCEALMENT
- 1.7 REMEDIAL *WORK*
- 1.8 LOCATION OF FIXTURES
- 1.9 FASTENINGS
- 1.10 PROTECTION OF *WORK* IN PROGRESS

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

- 2.1 QUALITY
- 2.2 AVAILABILITY
- 2.3 INSERTS, ANCHORS, AND FASTENERS

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

- 3.1 MANUFACTURER'S INSTRUCTIONS
- 3.2 OVERLOADING
- 3.3 GALVANIC/DISSIMILAR METAL CORROSION
- 3.4 PENETRATIONS
- 3.5 WORKMANSHIP

### **1.3 SUMMARY**

- .1 *Product* quality, availability, and delivery, storage, and handling.
- .2 Existing facilities.
- .3 Workmanship, coordination, and fastenings.
- .4 Manufacturer's instructions.

### **1.4 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*.

## 1.5 DELIVERY, STORAGE AND HANDLING

- .1 The *Contractor* is to be responsible for the costs of transportation of the Products required in the performance of the *Work*.
- .2 Transportation costs of Products supplied by the *Owner* will be paid for by the *Owner*.
- .3 The *Contractor* shall be responsible for unloading, handling, and storing all Products in accordance with the manufacturers' requirements and recommendations, and in a manner to prevent damage, adulteration, deterioration and soiling.
- .4 Store packaged or bundled Products in original and undamaged condition, with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in the *Work*.
- .5 Store Products subject to damage from weather in weathertight enclosures.
- .6 Store any cementitious products clear of earth or concrete floors, and away from walls.
- .7 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .8 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .9 Removal and replacement of Products damaged due to improper delivery, storage, or handling will not be considered or approved as a change in the *Work*.

## 1.6 CONCEALMENT

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls, and ceilings, except where indicated otherwise.
- .2 Before installation, inform the *Consultant* if there is a contradictory situation where concealment is not possible. Install as required by the *Consultant*.

## 1.7 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace the parts or portions of the *Work* identified as defective or unacceptable. Coordinate adjacent affected work as required.
- .2 Perform remedial work using specialists familiar with the materials affected. Perform the work in such a manner as to neither damage nor endanger any other portion of the *Work*.
- .3 Any remedial work required will not be considered or approved as a change in the *Work*.

## 1.8 LOCATION OF FIXTURES

- .1 Consider the location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform the *Consultant* of a conflicting installation and proceed as directed.

## 1.9 FASTENINGS

- .1 *Provide* metal fastenings and accessories in same texture, colour, and finish as adjacent materials, unless specifically indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.

- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in the *Contract Documents*.
- .4 Space anchors within their load limit or shear capacity and ensure that they *Provide* positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

#### 1.10 PROTECTION OF WORK IN PROGRESS

- .1 Adequately protect items of *Work* completed or in progress. *Work* damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the *Consultant*. Such removal and replacement, or repair, will not be considered or approved as a change in the *Work*.
- .2 Prevent overloading of any part of the *Work*. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without the written approval of the *Consultant*.

### PART 2 - PRODUCTS

#### 2.1 QUALITY

- .1 Products, construction materials and equipment, and articles (any of which may be referred to as "Products" throughout the *Contract Documents*) incorporated in the *Work* shall be new, not damaged or defective, and of the best quality (compatible with the *Contract Documents*) for the purpose intended. If requested, the *Contractor* shall furnish evidence as to the type, source, and quality of the Products provided.
- .2 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.
- .3 *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*.
- .4 Basis of design:
  - .1 Where *Contract Documents* list Basis of Design this indicates the *Product* or system that was used in the preparation of the design included in the *Contract Documents*, and which may be deemed as an acceptable *Product*.
  - .2 The basis of design establishes the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products from other manufacturers.
  - .3 This does not preclude the use of other *Products* or systems in the *Work*, provided the proposed *Product* or system complies with the design and performance requirements contained in the *Contract Documents*, and *Products* or systems proposed for use in the work that are not the named basis of design follow procedures for product substitutions specified under Section 01 25 00.
- .5 Where *Contract Documents* list acceptable *Products* or acceptable manufacturers, select as applicable, one *Product* meeting performance of specifications and manufacturer's written application directions.
- .6 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.
- .7 Defective *Products*, whenever identified prior to the completion of the *Work*, will be rejected, regardless of previous inspections or reviews. Inspection or review of the *Work* in progress by the *Consultant*, the *Owner*, or Independent Inspection and Testing Agencies does not relieve the *Contractor* of responsibility for the quality of the *Products* or *Work*, but, rather, is a precaution against oversight or error. The *Contractor* shall remove and replace defective *Products* at the *Contractor's* own expense and be responsible for any delays and expenses caused by rejection, which delays, and expenses will not be considered or approved as changes in the *Work*.
- .8 Should any dispute arise as to the quality or fitness of the *Products*, the decision rests solely with the *Consultant* and shall be based upon the requirements and intent of the *Contract Documents*.
- .9 Unless otherwise indicated in the *Contract Documents*, maintain uniformity of manufacture and manufacturer for any particular or similar item or items throughout the *Work*.
- .10 *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.

- .11 *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.
- .12 Permanent labels, trademarks, and nameplates on *Products* are not acceptable in prominent locations, except where required for operating instructions, or when located in the mechanical/electrical room, or as may be provided otherwise in the *Contract Documents*.
- .13 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*.

## 2.2 AVAILABILITY

- .1 While it was the intent of the *Bid Documents* and procedures, and the goal of the competitive *Bid* process that led to the formation of this *Contract*, to *Provide* unlimited competition to *Provide* *Products*, certain *Products* specified or indicated are accompanied by reference to brand names, proprietary names, trade marks, catalogue numbers, or catalogue designations or symbols, indicated as “acceptable products,” “acceptable materials,” or “acceptable manufacturers”. In such cases, the name of a distributor, supplier, or a dealer is sometimes given to assist the *Contractor* in finding a source of supply.
- .2 The naming of a source of supply does not relieve the *Contractor* of the responsibility of finding his or her own source of supply. If unable to obtain the specified *Product*, the *Contractor* shall supply a substitute *Product* equal to, or superior to, the *Product* specified and in accordance with the procedures and requirements of Section 01 25 00, which substitution will not be considered or approved as a change in the *Work*. Should the *Contractor* be unable to obtain a substitute *Product* equal to, or superior to, the specified *Product*, and the *Owner* accepts an inferior *Product*, the *Contract Price* shall be adjusted accordingly in an amount determined by the *Consultant*, in consultation with the *Contractor*, and in accordance with Section 01 26 00 *Contract Modification Procedures*.
- .3 The use of *Product* brand names, proprietary names, trade marks, catalogue numbers, or catalogue designations or symbols does not preclude the *Contractor* from proposing substitutions for the named *Products*, provided such proposals are in accordance with Section 01 25 00.

## 2.3 INSERTS, ANCHORS, AND FASTENERS

- .1 Use only factory made, threaded or toggle type inserts as required for supports and anchors, properly sized for load to be carried.
- .2 Where inserts cannot be placed, use factory made expansion shields for light weights only.
- .3 Supply and locate inserts, holes, anchor bolts and sleeves during placement or fabrication of structural elements.
- .4 Fasteners stressed in withdrawal are not acceptable, except where otherwise indicated.
- .5 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 Products in accordance with manufacturer's printed installation or application instructions. Do not rely on labels or enclosures supplied with Products. Obtain printed instructions directly from manufacturers.
- .2 Notify the *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 the *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. The *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 existing building from loads which may cause permanent deformation.
- .2 Protect the *Work* from loads which may cause permanent deformation.

#### **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 and design requirements appropriate for size of penetration.
  - .1 Finish penetrations in areas exposed to view to satisfaction of *Consultant*.

### 3.5 WORKMANSHIP

#### .1 General:

- .1 Execute the *Work* using workers experienced and skilled in the respective duties for which they are employed.
- .2 Do not employ an unfit person or anyone unskilled in their required duties.
- .3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the *Consultant*, whose decision is final.
- .4 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*.
- .5 Remove *Products* or materials that have been broken, chipped, cracked, discoloured, abraded, or damaged during construction period and *Provide* undamaged *Products* or materials meeting the requirements of the *Contract Documents*.

#### .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.
- .2 Before installation, inform the *Consultant* of any contradictory situation. Install as directed by the *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 the *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 the *Consultant's* acceptance for precise locations of fixtures, access panels, outlets, mechanical, and electrical items.
  - .3 The *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 the *Consultant* of conflicting installations. Install only as directed by the *Consultant*.
- .7 Fastenings:
- .1 *Provide* metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
  - .2 Prevent electrolytic action and corrosion between dissimilar metals and materials.
- .8 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 the *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.
- .9 Existing utilities:
- .1 When breaking into or connecting to existing services or utilities, execute the *Work* at times approved by the *Owner*, with a minimum of disturbance to *Owner's* ongoing operations, the *Work*, and traffic.
  - .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.
- .10 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 for 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 the *Consultant*.
- .11 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.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Overview of product/material selection requirements, procedures and submittals.

### **1.02 RELATED SECTIONS**

- A. 01 35 63 General LEED v4 Requirements
- B. 01 35 66 LEED v4 Project Management and Coordination
- C. 01 81 19 Indoor Air Quality Management for LEED v4
- D. Division 03 – Concrete
- E. Division 04 – Masonry
- F. Division 05 – Metals
- G. Division 06 – Woods, Plastics, and Composites
- H. Division 07 – Thermal and Moisture Protection
- I. Division 08 – Openings
- J. Division 09 – Finishes
- K. Division 10 – Specialties
- L. Division 32 – Exterior Improvements

### **1.03 DEFINITIONS**

- A. See Section 01 35 63 LEED v4 General Requirements.

### **1.04 REFERENCES**

- A. LEED v4 Building Design and Construction Guide for New Construction, U.S. Green Building Council, Credit Library.

### **1.05 OBJECTIVES**

- A. To minimize the ecological footprint of the building by specifically selecting materials that conserve raw and non-renewable resources.
- B. To minimize the amount of energy expended in the transportation of materials to the site through intentional sourcing of regional materials.
- C. To protect construction workers and future building occupants from indoor air quality problems resulting from chemicals in building materials.

- D. To achieve the targeted LEED v4 BD+C Materials and Resources Credits and Indoor Environmental Credits by meeting the requirements of the LEED v4 credits identified in the LEED v4 BD+C Checklist.

#### **1.06 DESCRIPTION OF WORK**

- A. The Contractor's project team shall be responsible for all aspects of LEED coordination related to the selection and sourcing of products and materials.
1. The site superintendent shall be responsible for ensuring only approved materials and products are used on the Project Site.
- B. Product and material selection activities shall include:
1. Preparing and submitting an itemized list of all materials and products that will be used in Divisions 3 through 10 and 32 at least two weeks in advance of mobilization
  2. Coordinating with subcontractors and trades to select products and materials that meet the requirements specified herein
  3. Providing acceptable LEED product and material documentation and submittals to the Consultant prior to ordering a product or material
  4. Providing itemized material costs (excluding labour and equipment) and product volumes to the Consultant for LEED v4 material credit calculations
  5. Reporting product/material selection progress to the Consultant

#### **1.07 SUBMITTALS**

- A. BPDO and LEM calculators and back-up documentation to be submitted as per 01 35 66 LEED v4 Project Management and Coordination, prior to any product being brought on site.
1. Materials calculators and back-up documentation to include the following at minimum:
    - a. Material cost, and product volume (where applicable)
    - b. Environmental Product Declarations (EPDs)
    - c. Material Ingredients Reporting (Health Product Declaration, Cradle to Cradle, Declare, etc.)
    - d. FSC certificate and corresponding invoice with itemized FSC purchases clearly noted
    - e. Recycled content (letter from manufacturer, certificate, etc.)
    - f. Regional content (letter from manufacturer, certificate, etc.)



g. VOC content (g/L)

h. CDPH emissions testing certification(s), such as Greenguard Gold, Indoor Advantage Gold, etc.

## 1.08 SUBSTITUTIONS/ALTERNATES

- A. Compliance with requirements needed to obtain LEED v4 Material and Resources and Indoor Environmental Quality credits and will be used as one criterion to evaluate requests for substitutions or alternates.
- B. When proposing a substitution/alternate, the Contractor must submit the applicable documentation described in 01 35 66 LEED v4 Project Management and Coordination, Submittals.

## PART 2 PRODUCTS

### 2.01 RECYCLED CONTENT

- A. Select products/materials that contain recycled content and that fall within divisions 3 through 10 and 32.
- B. In the absence of a specified product, minimum recycled content will be as follows:

Material	Target Material Value (by mass)	
	Min. Post-Consumer	Min. Pre-Consumer
Composite Wood (MDF, Particle Board)	0%	90%
Fiberglass Insulation	60%	0%
Mineral Wool Insulation	0%	40%
Gypsum (interior)	5%	90%
Ceramic Tile (Wall)	0%	35%
Ceramic Tile (Floor)	0%	30%
Acoustic Ceiling Tile	5%	40%
Suspended Ceiling T-Grid	15%	50%
Rubber Flooring	60%	5%
Linoleum	0%	35%
Carpet	5%	30%
Light Steel Framing (Steel Studs)	25%	5%
Structural Steel	25%	40%
Steel Deck	20%	25%
Concrete (% SCM Content in Cement)	0%	25%
Precast Concrete Products (% SCM Content in Cement)	0%	25%

Concrete Reinforcement	30%	65%
Masonry (% SCM Content in Cement)	0%	25%
Masonry – Light weight or acoustic (%SCM Content in Cement)	0%	60%

## 2.02 REGIONAL CONTENT

- A. Select products/materials that are extracted, manufactured and purchased regionally (within 160 km of project site as defined by LEED v4) and that fall within divisions 3 through 10 and 32.
1. At minimum the following materials should be regionally extracted, manufactured and purchased:
    - a. Ready-mix concrete
    - b. Recycled content steel

## 2.03 PRODUCTS DISCLOSURE AND OPTIMIZATION

- A. This section applies to the following product categories:
1. Adhesive and Sealants
  2. Paints and Coatings
  3. Flooring Materials
  4. Insulation, thermal and acoustic
  5. Panel products applied to ceilings and walls, including gypsum board and similar
  6. Composite Wood and Agrifibre Products
  7. Furniture
  8. All other finishes not covered by above categories
- B. For each product, provide one of the following Environmental Product Declarations (EPDs) that utilize Program Operator verified EPD, conform to ISO standards, and minimally include cradle-to-gate scope:
1. Industry Wide (Generic) EPDs that are for an entire industry
  2. Manufacturer Specific EPDs that are for brand-name products
- C. For each product, provide a manufacturer-declared or third-party verified Corporate Sustainability Report.
- D. For each product, provide one of the following Material Ingredients reporting documents:

1. Health Product Declaration
  2. Cradle to Cradle v2 Basic level or Cradle to Cradle v3 Bronze level
  3. Cradle to Cradle Material Health Certificate. The product has been certified at the Bronze level or higher and at least 90% of materials are assessed by weight.
  4. Declare label
- E. Any product that cannot comply with any one of the above requirements must be pre-approved for use by the Sustainability Consultant. Non-approved products cannot be brought on site.

#### **2.04 LOW EMITTING MATERIALS - ADHESIVES AND SEALANTS**

- A. All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, October 6, 2017, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. <http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1168.pdf>
1. Products with VOC contents exceeding these limits are prohibited on site.
  2. Any product that contains chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene is prohibited on site.
- B. All adhesives and sealants that are applied onsite and fall within the building weather barrier must be tested and determined compliant with CDPH Standard Method v1.2-2017 for VOC Emissions. For each product, provide one of the following third-party certifications:
1. GreenGuard Gold
  2. Indoor Advantage Gold – Scientific Certification Systems
  3. Other third-party certification that meets CDPH Standard Method v1.2-2017
- C. Any product that cannot comply with any one of the above requirements must be pre-approved for use by the Sustainability Consultant. Non-approved products cannot be brought on site.

#### **2.05 LOW EMITTING MATERIALS – PAINTS AND COATINGS**

- A. All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings <https://ww2.arb.ca.gov/sites/default/files/2020-10/2007%20SCM.pdf>, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016. <https://www.aqmd.gov/home/rules-compliance/compliance/vocs/architectural-coatings/tos>
1. Products with VOC contents exceeding these limits are prohibited on site.

2. Any product that contains chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene is prohibited on site.
- B. All paints and coatings that are applied onsite and fall within the building weather barrier must be tested and determined compliant with CDPH Standard Method v1.2-2017 for VOC Emissions. For each product, provide one of the following third party certifications:
1. GreenGuard Gold
  2. Indoor Advantage Gold – Scientific Certification Systems
  3. Other third-party certification that meets CDPH Standard Method v1.2-2017
- C. All paint and coating products must not contain lead.
- D. All paint and coating products must not contain intentionally added cadmium.

## **2.06 LOW EMITTING MATERIALS – FLOORING**

- A. Provide CRI Green Label Plus certification for each carpet product or certification confirming compliance with CDPH Standard Method v1.2-2017 for VOC Emissions.
- B. All carpet adhesives used for installations must adhere to requirements listed in Adhesives and Sealants section above.
- C. Carpet product with Styrene Butadiene backing will not be accepted as substitutions for specified carpet products.
- D. All resilient flooring products installed on site must be tested and determined compliant with CDPH Standard Method v1.2-2017 for VOC Emissions. For each product, provide one of the following third party certifications:
1. FloorScore – Resilient Floor Covering Institute
  2. GreenGuard Gold
  3. Indoor Advantage Gold – Scientific Certification Systems
  4. Other third-party certification that meets CDPH Standard Method v1.2-2017

## **2.07 LOW EMITTING MATERIALS – INSULATION, CEILINGS AND WALL PRODUCTS INCLUDING GYPSUM BOARD**

- A. All thermal and acoustic insulation, ceiling and wall products installed on site must be tested and determined compliant with CDPH Standard Method v1.2-2017 for VOC Emissions. For each product, provide one of the following third party certifications:
1. GreenGuard Gold

2. Indoor Advantage Gold – Scientific Certification Systems
3. Other third-party certification that meets CDPH Standard Method v1.2-2017

#### **2.08 LOW EMITTING MATERIALS – COMPOSITE WOOD AND AGRIFIBRE**

- A. All composite wood and/or agrifibre products (including core materials) used in the project must be documented to have low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.
- B. Salvaged and reused architectural millwork more than one year old at the time of occupancy is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.
- C. Adhesives used to fabricate laminated assemblies used/installed in the project that contain composite wood and/or agrifibre products must not contain added urea-formaldehyde.
- D. The requirements of paragraph A and B apply to all products/materials used/installed in the project regardless of whether they are manufactured on or off site. Examples include, but are not limited to: plywood, particle board, medium density fibre board (MDF), engineered wood flooring products, wood doors and frames.

#### **2.09 LOW EMITTING MATERIALS – FURNITURE**

- A. New furniture and furnishing items must be tested in accordance with ANSI/BIFMA M7.1–2011 Standard Test Method to determine VOC Emissions from Office Furniture Systems, Components and Seating.
- B. Salvaged and reused furniture more than one year old at the time of use is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.
- C. Furniture must comply with the low-emitting requirements in the ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 (for half credit, by cost) OR 7.6.2 (for full credit, by cost), using either the concentration modeling approach or the emissions factor approach. Documentation submitted for furniture must indicate the modeling scenario used to determine compliance.

#### **2.10 CERTIFIED WOOD**

- A. Products/materials to target include:
  1. Panel products (e.g. plywood, particle board, etc.)
  2. Millwork (e.g. cabinetry, trim, baseboards, etc.)
  3. Doors (including cores, rails, and stiles)

4. Hardwood and engineered wood flooring
  5. Furniture
  6. Wood framing and blocking
- B. For wood products that are not reused, salvaged, or recycled provide one of the following sustainable forestry certifications:
1. Forest Stewardship Council (FSC) (via FSC CoC Certificate)
  2. Sustainable Forestry Initiative Program (SFI) (via SFI CoC Certificate)
  3. American Tree Farm System (ATFS) (via SFI CoC Certificate)
  4. Canadian Standards Association (CSA) (via SFI CoC Certificate)
  5. Programme for Endorsement of Forest Certification (PEFC) (via PEFC CoC Certificate)
- C. Bamboo, non-wood forest products, and other materials that are not actually wood but are certified by FSC can count toward this credit
- D. Every entity that processes or trades certified material before it is shipped to the project site must have Chain of Custody (CoC) certification. On-site installers of certified products must have certification only if they modify the products off the project site.
- E. Certified products qualify for credit only when purchased from a vendor with an chain-of-custody certificate that is current at the time of sale.
- F. Each product shipped to the project site and contributing toward credit must be documented by an invoice from the CoC certificate holder
1. The invoice must report the vendor's CoC certificate code
  2. The invoice may aggregate the value of multiple products, as long as the cost of FSC products is isolated from other products and the vendor's CoC Certificate code is displayed on the invoice
  3. The invoice must show the entity being invoiced and indicate the delivery is intended for the LEED project
  4. The invoice or supplemental delivery slips must indicate that the product is being delivered directly to the project site if the installers do not possess a valid CoC.
- G. Products purchased from a vendor without chain of custody certification cannot contribute to credit, even if they bear a visible FSC or equivalent stamp.

1. If a non-CoC entity takes possession of the product at any time between the documented CoC vendor and the project site, the product is no longer be counted as certified.

## **2.11 LEAD RESTRICTIONS – PLUMBING, ELECTRICAL, ROOFING, DEMOLITION**

- A. For water intended for human consumption, all solder and flux must meet the California AB1953 standard, which specifies that solder not contain more than 0.2% lead, and flux not more than a weighted average of 0.25% lead for wetted surfaces.
  1. The “lead free” label as defined by the Safe Drinking Water Act (SDWA) may not qualify as the SDWA defines “lead free” as solders and flux containing 0.2% lead or less.
- B. For water intended for human consumption, all pipes, pipe fittings, plumbing fittings, and faucets must meet the California law AB1953 of a weighted average lead content of the wetted surface area of not more than 0.25% lead.
- C. All electrical wire and cable must have a lead content less than 300 parts per million.
- E. All roofing and flashings must not contain lead.
- F. During demolition, ensure the removal and appropriate disposal of disconnected wires with lead stabilizers, consistent with the 2002 National Electric Code requirements.

## **2.12 COPPER RESTRICTIONS – PLUMBING**

- A. For copper pipe applications, either:
  1. Install by using only mechanically crimped copper joint systems; or
  2. Ensure that all solder joints comply with ASTM B828 2002 and ASTM B813 2010 for flux.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### PART 1 - GENERAL

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUBMITTALS
- 1.4 PREPARATION
- 1.5 PERFORMANCE REQUIREMENTS

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

### **1.3 SUBMITTALS**

- .1 Submittal Items:
  - .1 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.
- .2 Include in the 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: Location of reinforcement in concrete structure confirmed by non-destructive, positive method other than X-ray.
- .3 Do not commence cutting, patching, or remedial work until request has been reviewed by *Consultant*.



## 1.4 PREPARATION

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting the performance of the *Work*.
- .3 Beginning of cutting and patching shall be taken to mean acceptance of the existing conditions.
- .4 *Provide* supports to assure the structural integrity of the surrounding elements as well as devices and methods to protect other portions of the *Work* from damage.
- .5 *Provide* protection from weather for areas that may be exposed by uncovering work.
- .6 Where uncovering of area exposes local deterioration, cracking, evidence of water infiltration, structural settlement, previous modifications, or other unexpected conditions, advise *Consultant* immediately in writing and leave conditions exposed until receipt of *Consultant's* written instructions. If area is exposed to the Exterior, *Provide* temporary protection from inclement weather.

## 1.5 PERFORMANCE REQUIREMENTS

- .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**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### PART 1 - GENERAL

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 ENVIRONMENTAL CONTROLS
- 1.4 MATERIALS
- 1.5 CLEANING DURING CONSTRUCTION

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

### **1.3 ENVIRONMENTAL CONTROLS**

- .1 Conduct cleaning and disposal operations to comply with local ordinances and antipollution 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.

### **1.4 MATERIALS**

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

### **1.5 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**

### **1.01 SECTION INCLUDES**

- A. Overview of demolition and construction waste management and disposal requirements and procedures for LEED v4.

### **1.02 RELATED SECTIONS**

- A. 01 35 63 General LEED v4 Requirements
- B. 01 35 66 LEED v4 Project Management and Coordination

### **1.03 DEFINITIONS**

- A. Solid Waste: Any waste material that is sent from the project site to another location for disposal.
- B. Salvage Materials: waste materials or materials that are existing on the site that can be reused or repurposed on site
- C. Reused Waste: Waste materials that are sent to an off-site location (e.g. another construction project or product supplier) where they are used in their original form (as opposed to being recycled or reprocessed into a new product).
- D. Recycled Waste: Waste materials that are sent off site to a recycling facility where they are used as feedstock in manufacturing processes that create new products.
- E. Landfill Waste: Waste materials that are sent to a landfill site for disposal.
- F. Categories of salvageable or recyclable waste include:
  - 1. Metals: metal scrap including iron, steel, copper, brass, and aluminum; includes beverage containers, packaging materials (such as metal banding), fencing, reinforcing bar, wiring, plumbing, etc.
  - 2. Untreated Wood: unpainted, untreated dimensional lumber, wood edging, wood shipping pallets, etc. Does not include pressure treated or creosote treated wood.
  - 3. Engineered Wood Products: plywood, oriented strand board, masonite, particleboard, manufactured trusses and beams, and glue-laminated timbers.
  - 4. Gypsum Wallboard: excess drywall construction materials including cuttings, other scrap, and excess materials.
  - 5. Cardboard: clean, corrugated cardboard such as used for packaging, etc.
  - 6. Paper Goods:

- a. Office paper: includes any paper, such as manufacturer instruction, specification sheets, files, correspondence, packaging, stiffeners, etc.
  - b. Newsprint: shredded or whole newspaper goods.
- 7. Plastic: beverage and food containers, packaging materials (such as polystyrene “peanuts” and expanded polystyrene), containers (other than those used for hazardous materials), vinyl products, etc.
- 8. Glass: includes glass beverage containers, and recyclable glass building materials.
- 9. Insulation: rigid foam, batt, and loose fill insulation materials.
- 10. Carpet: face fiber, backing, padding, and carpet cushion scrap.
- 11. Paints: unused portions of paints and coatings applied on site.
- 12. Fabric: uncontaminated fabric scraps.
- 13. Rubber: uncontaminated rubber scraps, including but not limited to recycled-content rubber flooring, rubber edging, etc.
- 14. Concrete, Masonry, Stone: concrete, brick, rock, clay, and other inert (non-organic) materials.
- 15. Other: any additional materials identified on site to be valued for salvage, reuse, or recycling by the Contractor, Owner, Construction Manager, Project Manager, Consultant, or Architect.
- 16. Non-Recyclable Waste: All waste materials that are not able to be recycled, due to contamination, lack of recycling facilities or salvage options, or high cost.
- G. Source Separated: Construction and demolition waste materials that are sorted by category into separate containers on site.
- H. Co-Mingled or commingle: Several categories of construction waste that are collected in a single container. Co-mingling of recycling waste must be approved by the identified recycling facility.
- I. Hazardous Waste: Any substance whose handling and/or disposal is regulated as hazardous waste by local, state, or federal authorities.

## 1.04 REFERENCES

- A. U.S. Green Building Council. LEED v4 BD+C credit "Construction and Demolition Waste Management," LEED v4 Building Design and Construction for New Construction, U.S. Green Building Council, Credit Library.

#### **1.05 OBJECTIVES**

- A. Minimize the amount of solid waste generated by construction, renovation and demolition (CRD) activities.
- B. Of the inevitable solid waste that is generated by construction, renovation and demolition activities, divert more than 75% from landfill (through reuse and recycling).
- C. Generate less than 50 kilograms of waste per square meter of the building's floor area.

#### **1.06 DESCRIPTION OF WORK**

- A. The Contractor will identify, implement and document measures to achieve the waste management objectives listed by implementing:

*Construction Waste Management Using Source Separation:* Arrange waste management service agreement(s) with a one or more subcontractors to haul waste bins sorted by material type on site by the Contractor and subcontractors.

- B. The Contractor's project team shall be responsible for all aspects of waste management and disposal, including documentation.
1. The site superintendent shall be responsible for all on-site aspects of waste management and disposal.
  2. The Contractor's designated team member is responsible for LEED documentation including initial and monthly submittals.
- C. Follow a strategy based on the 3R's hierarchy: Reduce the generation of waste materials at the project site, Reuse waste materials on other construction sites (when feasible) and Recycle waste materials as feedstock for manufacturing processes that create new products.
- D. Waste Management and Disposal activities shall include:
1. Arranging waste management service agreement(s) with waste haulers and waste receiving facilities
  2. Strategizing with suppliers to reduce materials packaging brought on to site
  3. Supervising on-site waste management activities on a daily basis

4. Coordinating waste management tasks with subcontractors to ensure timely and orderly progress of the work
5. Preparing/submitting waste management documentation and submittals to summarize all shipments of waste materials from the project site
6. Reporting waste management progress to the Consultant

#### **1.07 SUBMITTALS**

- A. Construction Waste Management Plan: Contractor shall develop a construction waste management plan indicating proposed methods for collection, segregation, and removal of all demolition and construction waste and debris produced by the work of this Contract. Those waste materials produced during the course of this Contract that can be recycled, shall be recycled. The Waste Management Plan shall provide, at a minimum, the following:
1. Identification that *Construction Waste Management Using Source Separation* is to be implemented on the project.
  2. Analysis of project waste to be generated, including types and predicted quantities.
  3. List of strategies for salvage, reuse, or recycling of each category of waste listed in Section 2.01B 1. Include additional waste materials that are possible to salvage, reuse, or recycle.
  4. Documentation to justify a request not to recycle any items listed in Section 2.01B 1.
  5. Waste management program to be submitted as follows:
    - a. Waste management program(s) from each subcontractor that will remove waste from site, including lists of the proposed receiving facilities for each material identified in paragraph 2.01B.1 and typical documentation package from each subcontractor.
      - i. Indicate the material types that will be addressed by each subcontractor and corresponding facilities and whether the material(s) will be reused, recycled or landfill.
      - ii. Identify any materials that are not recyclable or reusable that must be disposed of in a landfill or other means acceptable under governing federal, provincial and local regulations
      - iii. Include sample completed Waste Tracking Log as attached with these specifications or Contractor's own waste tracking log for acceptance by Consultant.
  6. Indicate any instances where compliance with requirements of this Section does not appear to be possible and request resolution from the Consultant.



- B. Monthly reporting: Contractor shall provide a monthly report to consultant that tracks all waste removed from site during the identified period.
1. Monthly reporting to be provided as follows:
    - a. LEED Waste Calculator listing all waste removed from site
    - b. Corresponding documentation of all LEED Waste Calculator entries:
      - i. Obtain waybills, invoices, letters and other documentation that clearly indicates the receiving facility, end use (reused, recycled or landfill) and quantity of waste for each shipment of waste generated on the project site. Record each shipment as it leaves site to ensure waybills are obtained.
  2. Final Waste Calculator and any outstanding documentation must be submitted to the Consultant within 14 days of substantial completion.

## **1.08 QUALITY ASSURANCE**

- A. Plan Revision: Make revisions to the Construction Waste Management Plan as recommended by the Consultant and resubmit the plan to the Consultant for approval.

## **PART 2 EXECUTION**

### **2.01 PROCEDURES**

- A. Waste Reduction
1. Arrange with suppliers and subcontractors to retrieve/retain packaging (e.g. skids, plastic wrap, etc.) for reuse.
    - a. Suppliers and sub-contractors must provide a letter stating the item(s) will be reused and documenting the quantity removed from the site.
  2. Prevent damage of materials due to mishandling, improper storage, and contamination.
  3. Where possible, use prefabricated assemblies built at a central facility to avoid waste generation at the site.
- B. Waste Diversion
1. Contact local salvaging/recycling facilities and arrange for recycling/reuse services. At minimum, the Contractor must ensure that all of the following materials will be recycled/reused if they will be generated throughout construction:
    - a. Steel and other metals

- b. Wood (see note below)
- c. Gypsum
- d. Cardboard
- e. Plastic
- f. Concrete / masonry / stone
- g. Carpet
- h. Glass
- i. "Blue Box" waste

**Note:** LEED does not accept the use of material as landfill cover as recycling or reuse. Materials disposed in this way will have a negative impact on the LEED v4 BD+C "Construction and Demolition Waste Management" credit.

Waste-to-energy programs may count as a diversion method if the facility meets European Union requirements for waste management and emissions into air, soil, surface water, and groundwater. This includes wood off-cuts taken offsite to be burned. Recommended strategies for recycling/reusing wood include encouraging suppliers to reuse wood pallets, sending wood pallets to pallet recycling companies and converting waste wood into landscaping mulch.

2. Designate a waste collection area on site that is dedicated to the separation and storage of all waste generated during construction.
  - a. Provide containers in the designated waste collection area that are sized to accommodate the separation and storage of expected waste categories and quantities. Provide separate containers for each of the following material categories as applicable to the phases of construction:
    - i. Steel and other metals
    - ii. Wood
    - iii. Gypsum
    - iv. Cardboard
    - v. Plastic
    - vi. Concrete / masonry / stone

- vii. Carpet
  - viii. Glass
  - ix. Asphalt
  - x. "Blue Box" waste (as per article 2.01B.7. below)
  - xi. Mixed waste
  - xii. Other types (as required by salvaging/ recycling facilities)
- 3. Clearly indicate the material type being collected and stored in each container using appropriate, easy-to-read signage.
  - 4. All sub-contractors are required to use the containers provided in the waste collection area.
  - 5. With no exceptions, if any material is removed by a subcontractor for either recycling or salvage, including items to be used on another project, the subcontractor must provide waybills, invoices, letters, photos and other documentation that clearly indicates the receiving facility or project, end use (reused, recycled) and quantity of waste in each. The Contractor is responsible for ensuring complete documentation is provided from any subcontractor removing waste from the site.
  - 6. Follow the salvaging/recycling facilities' material acceptance requirements to ensure materials are properly located and sorted, grouped, and packaged as required for collection.
  - 7. Provide "Blue Box" recycling bins at an accessible location for recycling waste generated by site workers and visitors. Waste deposited in these bins shall include the following, or adhere to the local recycling program:
    - a. Aluminum and steel food or beverage cans
    - b. Glass bottles and jars for food or beverages
    - c. Plastic containers for food or beverages
    - d. Cardboard and paper products

## **2.02 STORAGE AND HANDLING**

- A. Salvage Materials: Provide protective handling and storage as required for all items identified for salvage and reuse by the Owner, Construction Manager, Project Manager or Consultant.
- B. Recyclable Waste: Remove all recyclable materials, as identified in the Waste Management Plan, from the work location to appropriate containers daily. Failure to remove waste materials will be considered cause for withholding payment and/or termination of Contract.

- C. Provide collection containers as required by recycling haulers. Prevent contamination of materials, including protection from weather conditions as applicable.
- D. Replace loaded containers with empty ones as demand requires.
- E. Deposit all indicated recyclable materials in the containers in a clean (no mud, adhesives, solvents, petroleum contamination), debris-free condition. Do not deposit contaminated materials into the containers. Clean materials if possible.
- F. If contamination chemically combines with the material so that it cannot be cleaned, deposit into the waste rather than recycling container, if applicable.
- G. Transport waste materials from the work area to the designated containers and deposit them in a manner that minimizes noise and dust. Close container covers immediately after materials are deposited. Do not place waste materials on the ground adjacent to a container.

### **2.03 INSPECTIONS AND MAINTENANCE**

- A. Conduct daily inspections of containers to check for and remedy contamination.
  - 1. If contamination is observed, review waste management procedures with subcontractors.
- B. Promptly transport containers to receiving facilities when containers are full.
- C. Conduct daily inspections of material category labels on each waste container and remedy deficiencies promptly.
- D. Salvage Materials: Conduct regular inspections of protective covers and areas where salvage materials are being stored and remedy deficiencies promptly.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Protecting Installed Construction And Adjacent Property
- .4 1.4 Underground And Concealed Services
- .5 1.5 Waterproofing And Roofing
- .6 1.6 Making Good

### **1.3 PROTECTING INSTALLED CONSTRUCTION AND ADJACENT PROPERTY**

- .1 Refer to GC 9.1 - Protection of Work and Property
- .2 Refer to individual specification Sections for Product-specific requirements pertaining to the protection of installed Products.
- .3 Adequately protect parts of the Work that are either completed or in-progress.
- .4 Unless specified otherwise, maintain protection until Substantial Performance of the Work.
- .5 Provide protective coverings at walls, projections, corners and jambs, sills and soffits of openings in and adjacent to traffic areas.
- .6 Remove protection and protective coverings upon expiry of specified duration.
- .7 Protect Products from frost during construction.
- .8 Remove snow and ice from the uncompleted roof and from any floors.
- .9 As soon as the Work is sufficiently advanced, and in order to prevent delay, enclose the building with tarpaulins, plastic sheeting or glazing and temporary doors, with locks to doors as required.
- .10 Provide protection for completed and partially completed finishes and equipment during performance of the Work.
- .11 Protect pre-finished Products, including windows, louvers, finish hardware and doors from damage by mortar, paint, wallboard compounds and other construction materials and operations.
- .12 Protect new and existing trees and vegetation designated to remain from construction damage. Provide snow fencing or other protection where directed by Consultant.
  - .1 Conform to City of Vaughan Tree Protection Policy and Specifications for Construction Near Trees.

### **1.4 UNDERGROUND AND CONCEALED SERVICES**

- .1 Protect pipes, ducts, cables, conduits, wires and other services against damage arising from the performance of the Work.

- .2 Take necessary precautions to locate the underground and concealed services and to protect them from damage.

### **1.5 WATERPROOFING AND ROOFING**

- .1 Restrict traffic to waterproofed and roofed surfaces and restrict material storage on these surfaces.
- .2 When traffic or material storage is unavoidable, follow recommendations for protection of surfaces from manufacturer of roofing or waterproofing material.
- .3 Keep waterproofed and roofed surfaces free of debris.
- .4 Following completion of the roof system, adequately ventilate the Work to prevent moisture build up under the new roof membrane. Coordinate ventilation requirements with roof installer's recommendations.

### **1.6 MAKING GOOD**

- .1 Make Good means to restore new or existing work after being damaged, cut, patched or rejected by the Consultant. Use 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 new and original surfaces.
- .2 Make Good defective and damaged portions of the Work.
- .3 Make Good damage to property adjacent to the Place of the Work.
- .4 Make Good damage to the Work resulting from lack of adequate heating protection.
- .5 Make Good damaged services in accordance with the authority having jurisdiction.

### **PART 2 - PRODUCTS**

None is this Section.

### **PART 3- EXECUTION**

None is this Section.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 No less than two percent (2%) of the *Contract Price* shall be assigned as the cost for the preparation and delivery to the *Consultant* of the *Project Record Documents*. This value shall be indicated on the schedule of values in accordance with Sections 01 29 73 and 01 33 00.
- .3 The review to determine *Substantial Performance of the Work* will not take place until the documents and products described in this section have been received by the *Consultant*.
- .4 The procedures for completing *Contract* and acceptance by the *Owner* shall be in accordance with the methods described in OAA/OGCA Document 100 (July 1, 2018, and reissued January 8, 2019) and any additional requirements described below.
- .5 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.
- .6 Within 4 weeks of commencement of the *Work*, submit to the *Consultant* a list of closeout submittals required by the *Contract Documents*.

### **1.2 SECTION INCLUDES**

#### **PART 1 - GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 CLEANING PRIOR TO *SUBSTANTIAL PERFORMANCE OF THE WORK*
- 1.4 FINAL CLEANING
- 1.5 PROJECT RECORD DOCUMENTS
- 1.6 SPARE PARTS AND MAINTENANCE MATERIALS
- 1.7 SYSTEMS DEMONSTRATION
- 1.8 SUBSTANTIAL PERFORMANCE AND TAKEOVER PROCEDURES
- 1.9 WARRANTY PERIOD

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

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

### **1.3 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 1.4 - 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.

### **1.4 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.
  - .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 Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.
  - .12 Remove seal wrap on mechanical and electrical *Products* and materials and clean as required.
  - .13 Clean and/or replace lamps, light fixtures, lenses, and grilles.
  - .14 Remove protective covering and labels from lamps, hardware, and specialty items.
  - .15 Under the direction of the *Consultant*, aim adjustable luminaires.

## 1.5 PROJECT RECORD DOCUMENTS

- .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, asbuilt drawings, materials) for completeness.
  - .2 Review supply and completeness of spare parts required by *Contract Documents* and manufacturers.
  - .3 Review in relation to *Contract Price*, *Change Orders*, *Change Directives*, holdbacks and other adjustments to the *Contract Price*.
  - .4 Review inspection and testing reports to verify conformance to intent of *Contract Documents* and that changes, repairs or replacements have been completed.
  - .5 Execute transition of performance bond and labour and materials payment bond to warranty period requirements.
  - .6 Submit a final statement of accounting giving total adjusted *Contract Price*, previous payments, and monies remaining at time of application for completion of the *Contract*. *Consultant* will issue a final change order reflecting approved adjustments to *Contract Price* not previously made.
- .2 Operation and Maintenance Manuals:
- .1 Submit operation and maintenance manuals, consisting of the following general components:
    - .1 Operation and maintenance.
    - .2 Shop drawings.
    - .3 Warranties.
    - .4 *Project* data.
  - .3 Submit Operation and Maintenance Manuals as follows:
    - .1 Fifteen (15) Days prior to applying for the review to determine *Substantial Performance of the Work*, the *Contractor* shall submit to the *Consultant* digital versions ("PDF" files) of operation and maintenance manuals. Files shall be original PDF files, not scanned, and shall be searchable.
    - .2 Submit using digital storage medium or transfer process acceptable to the *Consultant* and the *Owner*.
    - .3 If revisions to the Operation and Maintenance Manuals are required, comments will be provided by the *Consultant* team for re-submission prior to undertaking the review to determine *Substantial Performance of the Work*.
    - .4 Manuals are to be re-submitted to the *Consultant* for review once any required revisions have been made.
    - .5 Manuals shall contain operational information on equipment, cleaning and lubrication schedules, filters, overhaul and adjustment schedules, and all other operation and maintenance information as required by the *Contract Documents*, including all warranties.
    - .6 Final Hard Copies, (3 Copies) shall be printed and submitted to the *Owner*. *Contractor* shall organize the data in the form of an instructional manual in binders of commercial quality, with hard covers, 8-1/2" x 11" in size, with a maximum ring size of 2". The following shall be followed:

- .1 On the cover, identify each binder with the typed or printed title "Operation and Maintenance Manuals," listing also the title of the project, and identifying the subject matter of the contents.
  - .2 Arrange the contents into applicable categories of work, parallel to the sections of the specifications.
  - .3 When multiple binders are used, correlate data into consistent related groupings.
  - .4 *Provide* tabbed fly-leaf for each separate product and system, with typed description of product and major component parts of equipment.
  - .5 If drawings are included, *Provide* with reinforced punched binder tab, bind in with text, folding drawings of a larger size to size of text pages.
  - .6 For each *Product* or system, list names, addresses, and telephone numbers of *Subcontractors* and Suppliers, including a local source of supplies and replacement parts.
  - .7 *Product* Data: mark each sheet to clearly identify specific products and component parts, as well as data applicable to the installation, and delete inapplicable information.
- .4 As-Built *Documents*:
- .1 Prior to the commencement of the *Work*, the *Consultant* will *Provide* the *Contractor* with a set of *Contract Documents* for the purpose of recording changes in the *Work*, as well as the actual locations of concealed services.
  - .2 Accurately and neatly record deviations from the *Contract Documents* caused by conditions at the *Place of the Work* and changes in the *Work* as the *Work* progresses.
  - .3 Record information by means of red felt-tip marker.
  - .4 Record, without being limited to, the following:
    - .1 Field changes of dimensions/details.
    - .2 Changes by Change Orders, Change Directives, and Supplemental *Instructions*.
    - .3 Locations of interior mechanical and electrical equipment and distribution.
    - .4 Specification as-builts: Record as-built *Products*, including manufacturer, manufacturer's model or system number.
  - .5 Identify each document as "As-Built Copy." Maintain in good condition in the *Site* office and make available for review by the *Consultant* and the *Owner* upon request.
  - .6 In the specifications, legibly mark each item to record actual construction, including manufacturers, trade names, and catalogue number for each product actually installed, particularly optional items and substitute items.
  - .7 Mechanical and electrical records shall be kept by the respective *Subcontractors* (who shall receive an extra copy each of the mechanical and electrical Drawings and specifications for this purpose from the *Contractor*), and shall be delivered to the *Contractor* who shall transfer the information to the As-Built Drawings.
  - .8 *Contractor* shall *Provide* As-Built Survey once foundations are completed to ensure building is situated as required. Drawing shall be submitted in PDF and CAD Format. *Contractor* shall *Provide* As-Built *Site* survey upon the completion of the project in PDF and CAD format.

- .9 On completion of the construction work, and fifteen (15) Days prior to applying for the review to determine *Substantial Performance of the Work*, the *Contractor* shall submit to the *Consultant* the complete *As-Built Documents*.
- .5 *Shop Drawings and Inspection Reports*:
  - .1 Fifteen (15) Days prior to applying for the review to determine *Substantial Performance of the Work*, the *Contractor* shall submit to the *Consultant* digital versions ("PDF" files) of all reviewed shop drawings including an inventory of the shop drawings submitted.
    - .1 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.
  - .2 Fifteen (15) Days prior to applying for review to determine *Substantial Performance of the Work*, the *Contractor* shall submit to the *Consultant* digital versions ("PDF" files) of all inspection and testing reports bound together in one (1) volume and arranged in chronological sequence.
- .6 *Warranties*:
  - .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.
- .7 *Project data*: 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 Workplace Safety & Insurance Board certificate of clearance.
    - .2 Certificates of approval of the *Work* by local building department (if available).
    - .3 Electrical authority certificate of inspection.
- .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.
- .3 Posted instructions shall include control diagrams with added specific operating instructions, controls, interlocks, and the like.
  - .4 Posted instructions shall include:
    - .1 HVAC controls for each system;
    - .2 One line schematic diagrams of water supply;
    - .3 One line isometric diagrams of sanitary drainage;
    - .4 One line diagrams of steam distribution, hot and cold water systems, including risers, valves, control devices, etc.

## 1.6 SPARE PARTS AND MAINTENANCE MATERIALS

- .1 At the time of submission of the *Project Record Documents*, or earlier if acceptable to the *Consultant* and the *Owner*, the *Contractor* shall submit to the *Owner* maintenance equipment for the various items, pieces of equipment, systems, or accessories required by the *Contract Documents*.
- .2 At the time of submission of the *Project Record Documents*, or earlier if acceptable to the *Consultant* and the *Owner*, the *Contractor* shall submit to the *Owner* extra materials for the various items, pieces of equipment, systems, or accessories required by the *Contract Documents*.
- .3 Spare parts, maintenance materials, and extra materials provided shall be new, not damaged or defective, and of same quality, manufacture, and manufacturer as of the Products provided in the *Work*. If requested, the *Contractor* shall furnish evidence as to the type, source, and quality of the Products provided.
- .4 Defective Products will be rejected, regardless of previous inspections. The *Contractor* shall replace such Products and such replacement will not be considered or approved as a change in the *Work*.
- .5 Store spare parts and maintenance materials in a manner to prevent damage or deterioration.
- .6 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.
- .7 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*.

## 1.7 SYSTEMS DEMONSTRATION

- .1 Refer also to requirements of Divisions 21, 22, and 23 and Divisions 26, 27, and 28 with respect to commissioning for control systems, 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.

- .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 Preparation:
  - .1 Submit to both the *Owner* and the *Consultant*, a schedule of time and date for demonstration of each item of equipment and each system at least fifteen (15) Days prior to designated dates.
  - .2 Ensure that the services, apparatuses, and equipment are installed and complete, have been inspected, tested and adjusted, and are all in perfect operating condition.
  - .3 Verify the conditions for demonstration and instructions comply with requirements and that designated personnel are present.
- .8 Demonstration and Instructions:
  - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment to *Owner*.
  - .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*.
  - .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.
- .9 Demonstration and instruction Report:
  - .1 Submit a written reports within five (5) *Working Days* after completion of demonstration, recording that demonstration and instructions have been satisfactorily completed. Report shall include time and date of each demonstration, instruction, and commissioning activity, complete with a list of persons present.
- .10 Correct deficiencies and defects identified during demonstration, instruction, or commissioning.
- .11 Attend 'end-of-work' testing and break-in or start-up demonstration.

## **1.8 SUBSTANTIAL PERFORMANCE AND TAKEOVER PROCEDURES**

- .1 A minimum of 60 Working Days prior to the anticipated Substantial Performance date, the *Contractor* (in writing) shall *Provide* a notice letter to the *Owner* of the anticipated Substantial Performance date.

- .2 The *Contractor* shall affirm the Substantial Performance date and *Provide* the *Owner* and the *Consultant* with a Notice Letter confirming the date, a minimum of 20 Working Days prior to the Substantial Performance date.
- .3 Deficiency review:
  - .1 The *Contractor* shall conduct an inspection of the *Work* to identify deficiencies and defects, which shall be repaired as required. 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 and apply for a review by the *Consultant* to establish *Substantial Performance of the Work*. Failure to include an item on the list does not alter the responsibility of the *Contractor* to complete the *Contract*.
  - .2 One week prior to the anticipated Substantial Performance date, the *Consultant*, the *Owner* and the *Contractor* will complete a deficiency walk through to confirm item 3 above. *Consultant* will *Provide* deficiency list with Value of Deficiency work to be complete.
  - .3 *Contractor* assumes prime responsibility for ensuring that items shown and described in the *Contract Documents* are complete. Any deficiency 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.
  - .4 No later than ten (10) *Working Days* after the receipt of the *Contractor's* application, the *Consultant* and the *Contractor* will review the *Work* to identify any defect or deficiencies. If necessary, the *Consultant* will tabulate a list of deficiencies to be issued to the *Contractor* for correction of same.
  - .5 The *Contractor* shall submit to the *Owner* and the *Consultant* a written Substantial Performance Application complete with all required documents. The application for Substantial Performance shall follow OAA/OGCA Take-Over-Procedures.
  - .6 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*.
- .4 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* (as may have been amended during the *Work*) have been substantially performed, the *Consultant* will issue a certificate of *Substantial Performance of the Work* to the *Contractor*, stating the date of *Substantial Performance of the Work*.
  - .2 The *Contractor* must obtain the *Owners* approval of the Certificate of Substantial Performance prior to publication.
  - .3 The certificate of *Substantial Performance of the Work* shall be prepared and issued in accordance with the Construction Act.
- .5 Final Inspection for completion of the *Contract*:
  - .1 Deficiencies and defects shall be made good before the *Contractor* submits a written request for final review of the *Work* and before the *Contract* is considered complete.
  - .2 When *Contractor* is satisfied that the *Work* is complete, and after the *Contractor* has reviewed the *Work* to verify its completion in accordance with the requirements of the *Contract*

*Documents*, the *Contractor* shall submit a written request for a final review by the *Consultant*, who in turn will notify the *Owner*.

- .3 If there are any deficiencies identified as a result of this review, they shall be listed by the *Consultant* and submitted to the *Contractor*. This list shall be recognized as the final deficiency list for purposes of acceptance of the *Work* under the *Contract*.
- .4 Such deficiencies shall be corrected by a date mutually agreed upon between *Consultant* and the *Contractor*, unless a specific date is required by *Contract*, and a further review by the *Consultant* shall be called for by the *Contractor* following his own review to take place within 7 days from date of request.
- .5 *Contractor* shall thereafter submit invoice for final payment.
- .6 Money 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.

## **1.9 WARRANTY PERIOD**

- .1 The Warranty Period shall commence in accordance with Article A-15 of the Agreement between *Owner* and *Contractor*.
- .2 Contractor shall provide on-going review and attendance to building call-back, maintenance, and repair problems during the warranty periods.
- .3 At the beginning of the 2<sup>nd</sup> last month of the Warranty Period, 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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 RELATED DOCUMENTS
- 1.4 SUMMARY
- 1.5 DEFINITIONS
- 1.6 CLOSEOUT SUBMITTALS

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

- 2.1 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS
- 2.2 OPERATION DATA
- 2.3 PRODUCT MAINTENANCE DATA
- 2.4 SYSTEMS AND EQUIPMENT MAINTENANCE DATA

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

- 3.1 MANUAL PREPARATION

### **1.3 RELATED DOCUMENTS**

- .1 The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections and Contractor's Submission Schedule, apply to this Section.

### **1.4 SUMMARY**

- .1 Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - .1 Operation and maintenance manual for systems, subsystems, and equipment.
  - .2 Product maintenance data.
  - .3 Systems and equipment maintenance data.
- .2 Related Sections:
  - .1 Section 01 33 00 – Submittal Procedures
  - .2 Section 01 77 00 – Contract Closeout Requirements
  - .3 Section 01 81 13 – Sustainable Design Requirements
  - .4 Section 01 91 13 – General Commissioning Requirements

### **1.5 DEFINITIONS**

- .1 System: An organized collection of parts, equipment, or subsystems united by regular interaction.



- .2 Subsystem: A portion of a system with characteristics similar to a system.

## **1.6 CLOSEOUT SUBMITTALS**

- .1 Required Manuals: see Section 01 77 00 – Contract Closeout Requirements for additional requirements.
- .2 Format: Submit operations and maintenance manuals in the following format:
  - .1 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to the Design Professional.
    - .1 Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - .2 Enable inserted reviewer comments on draft submittals.

## **PART 2 - PRODUCTS**

### **2.1 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS**

- .1 Organization: Organize the manual into separate sections by CSI number based on the table of contents of the project manual, for each system and subsystem, and a separate section for each piece of equipment not part of a system. The manual shall contain the following materials, in the order listed:
  - .1 Title page.
  - .2 Table of contents.
  - .3 Manual contents:
    - .1 Operation data.
    - .2 Product maintenance data.
    - .3 Systems and equipment data
- .2 Title Page: Include the following information:
  - .1 Subject matter included in manual.
  - .2 Name and address of Project.
  - .3 Name and address of Owner.
  - .4 Date of submittal.
  - .5 Name and contact information for Contractor.
  - .6 Name and contact information for Construction Manager.
  - .7 Name and contact information for Design Professional.
  - .8 Name and contact information for Commissioning Agent.
  - .9 Names and contact information for major consultants to the Design Professional that designed the systems contained in the manuals.
  - .10 Cross-reference to related systems in other operation and maintenance manuals.

- .3 Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - .1 If operation or maintenance documentation requires more than one media volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- .4 Manual Contents: Organize into sets of manageable size. Arrange contents by CSI Section number and then by system, subsystem, and equipment.
- .5 Manuals, Electronic Copy: Submit electronic (PDF) copy of the manual, to the Design Professional, concurrent with Action Submittal.

## **2.2 OPERATION DATA**

- .1 Content: In addition to requirements in this Section, include operation data required in individual Specification Section and the following information:
  - .1 System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - .2 Operating standards.
  - .3 Operating procedures.
  - .4 Operating logs.
  - .5 Wiring diagrams.
  - .6 Control diagrams.
  - .7 Piped system diagrams.
  - .8 Precautions against improper use.
  - .9 License requirements including inspection and renewal dates.
- .2 Descriptions: Include the following:
  - .1 Product name and model number. Use designations for products indicated on Contract Documents.
  - .2 Manufacturer's name.
  - .3 Equipment identification with serial number of each component.
  - .4 Equipment function.
  - .5 Operating characteristics.
  - .6 Limiting conditions.
  - .7 Performance curves.
  - .8 Engineering data and tests.
  - .9 Complete nomenclature and number of replacement parts.
- .3 Operating Procedures: Include the following, as applicable:

- .1 Startup procedures.
- .2 Equipment or system break-in procedures.
- .3 Routine and normal operating instructions.
- .4 Regulation and control procedures.
- .5 Instructions on stopping.
- .6 Normal shutdown instructions.
- .7 Seasonal and weekend operating instructions.
- .8 Required sequences for electric or electronic systems.
- .9 Special operating instructions and procedures.
- 4 D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- 5 E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

## **2.3 PRODUCT MAINTENANCE DATA**

- .1 Content: Organize data into a separate section, within the O & M Manual, for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- .2 Source Information: List each product included in section identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- .3 Product Information: Include the following, as applicable:
  - .1 Product name and model number.
  - .2 Manufacturer's name.
  - .3 Color, pattern, and texture.
  - .4 Material and chemical composition.
  - .5 Reordering information for specially manufactured products.
- 4 Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - .1 Inspection procedures.
  - .2 Types of cleaning agents to be used and methods of cleaning.
  - .3 List of cleaning agents and methods of cleaning detrimental to product.
  - .4 Schedule for routine cleaning and maintenance.
  - .5 Repair instructions.

- .5 Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- .6 Warranties and Guarantees: Include copies of warranties and guarantees lists of circumstances and conditions that would affect validity of warranties.
  - .1 Include procedures to follow and required notifications for warranty claims.

## **2.4 SYSTEMS AND EQUIPMENT MAINTENANCE DATA**

- .1 Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- .2 Source Information: List each system, subsystem, and piece of equipment included in a separate section within the O & M Manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- .3 Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - .1 Standard maintenance instructions and bulletins.
  - .2 Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - .3 Identification and nomenclature of parts and components.
  - .4 List of items recommended to be stocked as spare parts.
- .4 Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - .1 Test and inspection instructions.
  - .2 Troubleshooting guide.
  - .3 Precautions against improper maintenance.
  - .4 Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - .5 Aligning, adjusting, and checking instructions.
  - .6 Demonstration and training video recording, if available.
- .5 Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - .1 Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - .2 Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

- .6 Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- .7 Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties.
  - .1 Include procedures to follow and required notifications for warranty claims.

## **PART 3 - EXECUTION**

### **3.1 MANUAL PREPARATION**

- .1 Operation and Maintenance Documentation shall be provided for review, concurrent, with Action Submittal specified in Individual Specification Section.
  - .1 Correct or modify the manual to comply with the Design Professional's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Design Professional's and Commissioning Authority's comments and prior to commencing demonstration and training.
- .2 Product Maintenance Data: Assemble a complete set of maintenance data, in a separate section, within the O & M Manual, indicating care and maintenance of each product, material, and finish incorporated into the Work.
- .3 Operation and Maintenance Data: Assemble a complete set of operation and maintenance data, in a separate section, within the O & M Manual, indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - .1 Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - .2 Prepare a separate section within the O & M Manual, for each system and subsystem, in the form of an instructional manual for use by operating personnel.
- .4 Manufacturers' Data: Where manual contain manufacturers' standard printed data; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - .1 Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- .5 Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in As-built Drawings to ensure correct illustration of completed installation.
  - .1 Do not use original project record documents as part of operation and maintenance manuals.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL REQUIREMENTS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### PART 1 - GENERAL

##### 1.1 GENERAL REQUIREMENTS

##### 1.2 SECTION INCLUDES

##### 1.3 WARRANTIES

##### 1.4 EXTENDED WARRANTIES

#### PART 2 - PRODUCTS

#### PART 3 - EXECUTION

### **1.3 WARRANTIES**

- .1 Refer to Article A-15 of the Agreement between *Owner* and *Contractor* for the Warranty Periods provisions, and as follows:
  - .1 Warranties shall commence at date of *Substantial Performance of the Work*.
  - .2 Submit warranties for applicable items, signed by the applicable company responsible for each warranty.
  - .3 Submit warranties on form approved by *Owner* including, but not limited to, the following information:
    - .1 Name and address of Project.
    - .2 Warranty commencement date (date of *Substantial Performance of the Work*).
    - .3 Duration of warranty.
    - .4 Clear indication of what is being warranted and what remedial action will be taken under warranty.
    - .5 Authorized signature and seal of company providing each warranty.
  - .2 *Owner* shall be named in manufacturer's *Product* warranties. Submit on relevant *Product* manufacturer's standard warranty or guarantee form.
  - .3 The *Owner* will give prompt notice in writing to the *Consultant* of any defects noted during the warranty periods(s) and the *Consultant* shall notify the *Contractor* promptly requesting him to remedy such defects.
  - .4 A minimum of 30 *Working Days* prior to the expiration of the Warranty Period stipulated in Article A-15 of the Agreement between *Owner* and *Contractor*, the *Owner*, the *Consultant* and the *Contractor* shall conduct an inspection of the *Work*. The *Contractor* shall promptly remedy any defects due to faulty materials or workmanship.
  - .5 Use of permanent heating system for temporary heat shall not affect requirement that all warranties start on the date specified in Article A-15 of the Agreement between *Owner* and *Contractor*.

- .6 Prior to application for *Substantial Performance of the Work*, the *Contractor* shall formally assign to the *Owner* all extended warranties given by *Subcontractors* for their *Work* on the project and such *Subcontractors* shall be formally advised of the assignment.

#### 1.4 EXTENDED WARRANTIES

- .1 Extended warranties shall be in accordance with the *Contract* 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**

## PART 1 – GENERAL

### 1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### 1.2 SECTION INCLUDES

- 1.1 General Instructions
- 1.2 Section Includes
- 1.3 Related Documents
- 1.4 Summary
- 1.5 Closeout Submittals

#### Part 2 - Products

- 2.1 As-Built Drawings
- 2.2 As-Built Specifications
- 2.3 As-Built Schedule
- 2.4 Record Product Data
- 2.5 Miscellaneous Record Submittals

#### Part 3 - Execution

- 3.1 Recording And Maintenance

### 1.3 RELATED DOCUMENTS

- .1 The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

### 1.4 SUMMARY

- .1 Section includes administrative and procedural requirements for As-built documents, including the following:
  - .1 As-built Drawings
  - .2 As-built Specifications
  - .3 As-built Schedule
  - .4 Record Product Data
  - .5 Miscellaneous record submittals
- .2 Related Sections:
  - .1 Section 01 32 00 – Construction Progress Documentation
  - .2 Section 01 33 00 – Submittal Procedure; Required Submittal List
  - .3 Section 01 77 00 – Contract Closeout Requirements
  - .4 Section 01 78 23 – Operation and Maintenance Manuals



- .3 Administrative and procedural requirements for contract turnover documents, including, but not limited to the following, as provided in Individual Specifications Sections.
  - .1 Sustainable Documents
  - .2 Commissioning Documents
  - .3 Hazardous Waste Documents

## **1.5 CLOSEOUT SUBMITTALS**

- .1 Required Documents: Section 01 77 00 – Contract Closeout Requirements, describes administrative requirements for submission, number and type of copies required for contract closeout requirements.

## **PART 2 - PRODUCTS**

### **2.1 AS-BUILT DRAWINGS**

- .1 As-built Drawings: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings onsite. Review As-built Drawings and shop drawings monthly with the Owner, for approval.
  - .1 Preparation: Daily mark As-built Drawings to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up As-built Drawings.
    - .1 Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - .2 Accurately record information in an acceptable drawing technique.
    - .3 Record data as soon as possible after obtaining it.
    - .4 Record and check the markup before enclosing concealed installations.
  - .2 Content: Types of items requiring marking include, but are not limited to, the following:
    - .1 Dimensional changes to Drawings.
    - .2 Revisions to details shown on Drawings.
    - .3 Depths of foundations below first floor.
    - .4 Locations and depths of underground utilities.
    - .5 Revisions to routing of piping and conduits.
    - .6 Revisions to electrical circuitry.
    - .7 Actual equipment locations.
    - .8 Duct size and routing.
    - .9 Locations of concealed internal utilities.
    - .10 Changes made by Change Order.
    - .11 Changes made by Bulletin.

- .12 Changes made following the Owner's written orders.
- .13 Details not on the original Contract Drawings.
- .14 Field records for variable and concealed conditions.
- .15 Record information on the Work that is shown only schematically.
- .3 Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up as-built prints.
- .4 Mark as-built sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
- .5 Mark important additional information that was either shown schematically or omitted from original Drawings.
- .6 Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

## **2.2 AS-BUILT SPECIFICATIONS**

- .1 Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  - .1 Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - .2 Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  - .3 Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  - .4 For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
  - .5 Note related Change Orders, record Product Data, and turnover Drawings where applicable.

## **2.3 AS-BUILT SCHEDULE**

- .1 Final Schedule: Submit to the Owner a final schedule update. The As-built Schedule shall reflect the exact manner in which the project was actually constructed including actual start and finish dates, activities, sequences and logic.
  - .1 The Contractor shall certify the final schedule update as being a true reflection of the way the project was actually constructed.

## **2.4 RECORD PRODUCT DATA**

- .1 Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - .1 Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - .2 Include significant changes in the product delivered to the Project site and changes in manufacturer's written instructions for installation.
  - .3 Note related Change Orders, As-built Specifications, and As-built Drawings where applicable.

## **2.5 MISCELLANEOUS RECORD SUBMITTALS**

- .1 Assemble miscellaneous records required by Individual Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- .2 Format: Submit miscellaneous record submittals.
  - .1 Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

## **PART 3 - EXECUTION**

### **3.1 RECORDING AND MAINTENANCE**

- .1 Maintain Change Log: Maintain and submit written change log to the Owner, monthly for review indicating items incorporated in contract turnover documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.
- .2 Recording: Maintain one copy of each submittal during the construction period for contract turnover document purposes. Post changes and modifications to contract turnover documents as they occur; do not wait until the end of the Project.
- .3 Maintenance of Turnover Documents and Samples: Store turnover documents and Samples in the field office apart from the Contract Documents used for construction. Contract turnover documents are not to be used for construction purposes. Maintain turnover documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to contract turnover documents for the Owner's reference during normal working hours during performance of Contract.

**END OF SECTION**

## **1. GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Overview of indoor air quality management testing and procedures

### **1.2 RELATED SECTIONS**

- .1 01 35 63 General LEED v4 Requirements
- .2 01 35 66 LEED v4 Project Management and Coordination
- .3 01 57 13 Construction Activity Pollution Prevention
- .4 01 60 13 LEED v4 Product Requirements
- .5 01 74 19 Waste Management Requirements for LEED v4
- .6 Division 23 HVAC

### **1.3 DEFINITIONS**

- .1 See Section 01 35 63 General LEED v4 Requirements

### **1.4 REFERENCES**

- .1 ASTM E2114, Standard Terminology for Sustainability Relative to the Performance of Buildings.
- .2 ASTM E2129, Standard Practice Data Collection for Sustainability Assessment of Building Products.
- .3 U.S. Green Building Council. LEED v4 BD+C credits "Indoor Air Quality Assessment", LEED v4 Building Design and Construction Guide, U.S. Green Building Council, Credit Library.
- .4 U.S. Environmental Protection Agency "Compendium of Methods for the Determination of Air Pollutants in Indoor Air."

### **1.5 OBJECTIVES**

- .1 To achieve credit "Indoor Air Quality Assessment" of LEED v4.1 BD+C by meeting the requirements of Option 1, Path 1 Flush-out Before Occupancy or Option 2 Air Testing.
- .2 Protect future building occupants from indoor air quality problems resulting from construction activities and building materials.

### **1.6 DESCRIPTION OF WORK**

- .1 Contractor shall schedule work to allow for a flush-out period as follows:
  - .1 After all construction including punch-list items and final cleaning are completed
  - .2 Before occupancy
  - .3 Volume of fresh air required is 4,000 cubic feet of outdoor air per square foot (4,267,140 liters of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%.
  - .4 Provide trend log and report on flush-out procedure

- .2 If schedule becomes compressed due to construction delay, contractor shall implement Option, IAQ Testing as follows:
- .3 An independent testing and inspecting agency shall conduct a baseline indoor air quality testing program according to the allowable U.S. Environmental Protection Agency, ISO and/or ASTM standards.
- .4 Conduct a limited flush-out as directed by the Consultant directly prior to scheduled indoor air quality testing.
- .5 Conduct one baseline indoor air quality testing that is scheduled as follows:
  - .1 Prior to occupancy
  - .2 After all construction, including deficiencies, is complete
  - .3 After all furniture is installed if indicated by Consultant
  - .4 HVAC systems shall be running in typical occupied mode during sampling period
- .6 Testing shall demonstrate contaminant concentrations do not exceed the following levels:

Indoor Contaminant			Maximum Concentration
Particulates	PM10		50 µg/m³
	PM2.5		12 µg/m³ (Projects in areas with high ambient levels of PM2.5 (EPA nonattainment areas) must meet the 35 ug/m³ limit)
Ozone (for buildings in EPA nonattainment areas for Ozone, or local equivalent)			0.07 ppm
Carbon monoxide (CO)			9 ppm; no more than 2 ppm above outdoor levels
Total volatile organic compounds (TVOCs)			500 µg/m³
Formaldehyde			20 µg/m³ (16 ppb)
Target volatile organic compounds	1	Acetaldehyde	140 µg/m³
	2	Benzene	3 µg/m³
	7	Dichlorobenzene (1,4-)	800µg/m³
	19	Hexane (n-)	7000 µg/m³
	25	Naphthalene	9 µg/m³
	26	Phenol	200 µg/m³
	28	Styrene	900 µg/m³
	29	Tetrachloroethylene (Perchloroethylene)	35 µg/m³
	30	Toluene	300 µg/m³
	32	Vinyl acetate	200 µg/m³
	33-35	Xylenes, technical mixture (m-, o-, p-xylene combined)	700 µg/m³

- .7 If initial testing results do not meet one or more requirements, conduct building flush-out and retest at same locations until concentration requirements are achieved.
- .8 Costs for IAQ testing is responsibility of contractor unless agreed upon otherwise with project owner and prime consultant.

## 1.7 SUBMITTALS

- .1 If implementing Option 1, Path Flush-out Before Occupancy, provide flush-out plan indicating length of time allotted for flush-out based on building area and air handling unit capacities.
  - .1 Add 20% additional back-up time to flush-out period in case systems do not maintain required temperature and humidity levels.
  - .2 Identify responsible parties for programming BAS, alerts and trend logging set-up.
  - .3 Identify responsible party for daily progress review, including over weekends as applicable.
  - .4 Plan to be reviewed by project owner and consultant team at least 5 business days prior to proposed flush-out start date.
- .2 If Option 1, IAQ Testing is being implemented, provide an IAQ Test Plan as follows:
  - .1 IAQ Test Plan shall include a description of testing to be conducted, HVAC equipment operating parameters and proposed test date(s).
  - .2 Provide for review by the project owner and consultant team at least 48 hours in advance of the proposed testing date.
- .3 Upon completion of Building Flush-out or IAQ testing, provide as applicable:
  - .1 A report confirming:
    - a. All construction including punch-list items were completed before flush-out began
    - b. Description of the flush-out procedure including date and times
    - c. Confirmation that temperature and humidity parameters were in compliance for the duration of the flush-out
    - d. Provide BAS/BMS trend log as an appendix
  - .2 A copy of the IAQ testing results that documents the compliant results and identifies the EPA testing method used.

## 2. EXECUTION

### 2.1 BUILDING FLUSH-OUT

- .1 Determine fresh air capacity of building air handling units
- .2 Calculate time required to supply 4,000 cubic feet of outdoor air per square foot (4 267 140 liters of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%.
- .3 Ensure building management or building automation systems is programmed to provide the fresh air during the allotted time and produce a trend log tracking all required parameters

### 2.2 BASELINE IAQ TESTING

- .1 Before occupancy, the IAQ Testing Contractor shall take air samples at locations determined in conjunction with the Consultant.
- .2 HVAC System Verification: The Contractor shall comply with all cleaning, testing, adjusting, balancing, start-up, and commissioning requirements contained in these specifications.
- .3 Upon verification of the HVAC system operation, and all deficiencies are complete, and furniture is installed if indicated by Consultant, the independent IAQ Testing Contractor shall conduct testing for concentrations as detailed above.

- .4 The test plan shall be submitted for the approval of the Consultant. The plan shall specify procedures, times, instrumentation, and sampling methods to be employed.
- .5 Air sampling shall comply with LEED v4 BD+C credit "Indoor Air Quality Assessment", LEED v4 Building Design and Construction Guide for New Construction, U.S. Green Building Council, Credit Library.
- .6 Air sampling to be conducted within the breathing zone; between 3 ft. and 6 ft. above the floor level.
- .7 Test reports shall indicate the results and location of each test, a summary of the HVAC operating conditions, a listing of discrepancies and recommendations for corrective actions.
  - .1 Include certification of test equipment calibration with each test report.
- .8 If testing indicates concentrations exceeding maximum acceptable levels, complete retesting after additional flush-out.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Overview of indoor air quality management requirements and procedures

### **1.02 RELATED SECTIONS**

- A. 01 35 63 General LEED v4 Requirements
- B. 01 35 66 LEED v4 Project Management and Coordination
- C. 01 60 13 LEED v4 Product Requirements
- D. 01 81 14 Indoor Air Quality Testing or Flush-out for LEED v4

### **1.03 DEFINITIONS**

- A. See Section 01 35 63 General LEED v4 Requirements for general definitions

### **1.04 REFERENCES**

- A. Sheet Metal and Air-Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008 (Chapter 3)
- B. ASHRAE Standard 52.2–2007
- C. California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.2–2017
- D. State of California. South Coast Air Quality Management District (SCAQMD) Rules 1168. Current Edition.
- E. State of California. South Coast Air Quality Management District (SCAQMD) Rules 1113. Current Edition.
- F. U.S. Green Building Council. LEED v4 BD+C credits “Construction Indoor Air Quality Management Plan” and “Low-Emitting Materials”, LEED v4 Interior Design and Construction Guide for Commercial Interiors, U.S. Green Building Council, Credit Library.

### **1.05 OBJECTIVES**

- A. Meet or exceed the recommendations of Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008 (Chapter 3)



- B. Protect construction workers and future building occupants from indoor air quality problems resulting from construction/renovation activities and building materials.
1. Reduce the production and circulation of pollutants during construction.
  2. Protect equipment and absorptive materials stored and installed on-site from moisture, dust and dirt accumulation during construction.
  3. Prohibit the use of tobacco products during construction inside the building and within 25 feet (7.5 meters) (or greater, if required by the local jurisdiction) of the building entrance or any openings in the building envelope.
  4. Must install filtration media MERV 8 or higher on return air side of any permanently installed air-handling equipment, if used during construction. Filtration media must be replaced with new ones immediately before occupancy.
- C. Develop and implement an indoor air quality (IAQ) management plan for the construction and preoccupancy phases of the building. The plan must address all objectives listed above.

#### **1.06 DESCRIPTION OF WORK**

- A. The Contractor's project team shall be responsible for ensuring all indoor air quality requirements are met and documented during construction.
1. As per Section 01 35 66 LEED v4 Project Management and Coordination, the designated member of the Contractor project team shall be responsible for developing the Indoor Air Quality Management plan and coordinating and submitting all related documentation.
  2. The Indoor Air Quality Plan, that includes measures to achieve the indoor air quality management objectives, must be developed before construction begins
  3. The site superintendent shall be responsible for ensuring the Indoor Air Quality Management plan is implemented and followed consistently on-site during construction.
- B. Indoor air quality management activities shall include:
1. Supervising on-site indoor air quality management activities on a daily basis
  2. Coordinating indoor air quality management tasks with subcontractors to ensure timely and orderly progress of the work
  3. Conducting indoor air quality management inspections, documenting with relevant photos, and making necessary repairs.
  4. Maintaining an indoor air quality inspection log to document observations, deficiencies and corrective actions

5. Preparing indoor air quality management documentation and submittals as detailed herein
  6. Selecting products/materials that meet the requirements specified herein and in Section 01 61 13.
  7. Providing product and material documentation and submittals to the Consultant as detailed herein prior to ordering a product or material
  8. Ensure no unreviewed or unknown products are used on-site
  9. Reporting indoor air quality management progress to the Consultant on a weekly basis.
- C. Develop and implement project schedule to follow required Sequence of Finish Installation as detailed in Part 3.

#### **1.07 SUBMITTALS**

- A. Submit to the Consultant the Indoor Air Quality Plan prior to mobilization on site
1. Indicate what measures will be taken to meet or exceed the recommendations of Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008 (Chapter 3), including:
    - a. HVAC Protection
    - b. Source Control
    - c. Pathway Interruption
    - d. Scheduling
    - e. Housekeeping
  2. Indoor Air Quality Plan to list MERV ratings of each air filter used during construction and MERV rating of each air filter installed at the end of construction and immediately before occupancy
  3. Indoor Air Quality Plan to provide detail on how non-smoking policy will be enforced including penalties for non-compliance.
  4. Indoor Air Quality Plan to provide detail on how absorbent materials will be protected.
- B. Submit Low-Emitting Materials (LEM) calculator and supporting documentation (third-party certifications, MSDSs, product data sheets, letter from manufacturers, etc.) to document the following:
1. VOC content in g/L for all adhesives, sealants, paints and coatings that fall within the building weather barrier

2. CDPH Compliant VOC emission testing documentation or approved third party certification that uses the CDPH standard v.1.2-2017
  3. No added urea-formaldehyde in binders and resins used in all wood-based and bio-based products as documented by CARB compliance
  4. All flooring products
  5. Thermal and acoustic insulation
  6. Wall and ceiling products including panel products installed such as gypsum board.
  6. Furniture and all finish materials
- C. Submit completed Low-Emitting Materials (LEM) calculator and corresponding backup documentation to the Consultant for review at least 14 days prior to mobilization of trade(s) who proposes to use them on site
- D. IAQ Management Inspection Log
1. Complete an IAQ inspection log on a weekly basis. The log shall commence when HVAC sheet metal work begins or when the installation of the project envelope work begins, whichever comes first, and carry through to project turnover.
  2. The inspection log shall be completed for each weekly inspection and must document:
    - a. Indoor air quality management measures implemented on site
    - b. Deficiencies related to those measures
    - c. Corrective actions taken to remedy deficiencies
  3. Each deficiency must be initialed and each log signed after all corrective measures have been completed and documented.
  4. Submit an up-to-date copy of the IAQ Management Inspection Log to the Consultant on a monthly basis.
- F. Provide photos of indoor air quality measures implemented on site.
1. Date stamped photographs must be taken weekly during construction to demonstrate continuous compliance.
  2. Photographs must be submitted with a description or caption identifying the indoor air quality management measure being depicted in each individual photo.
  3. A minimum of four photos over the course of the project are required depicting each of the following SMACNA categories:

- a. HVAC Protection; examples include:
    - i. Installed duct work wrapped in plastic
    - ii. Pre-installation duct work wrapped in plastic or tarped
    - iii. Return air ducts protected with MERV 8 filter media
  - b. Source Control; examples include:
    - i. Low emitting or low VOC product containers
    - ii. Signage prohibiting smoking and gas-powered equipment inside and near any unprotected openings
    - iii. Direct exhaust or portable air cleaners in areas of work
  - c. Pathway Interruption; examples include
    - i. Dust curtains or sealed hoarding isolating finished or occupied areas
    - ii. Contain cutting areas with dust curtains, deck-to-deck partitions or hoarding
    - iii. Sealing of exterior openings to protect from precipitation or nearby contaminants
    - iv. Walk-off mats installed at entrances/exits/high-traffic areas
  - d. Scheduling; examples include
    - i. Painting completed before carpet installation
    - ii. Painting completed before ceiling tile installation
    - iii. All finishes and furniture installed prior to IAQ test
  - e. Housekeeping; examples include
    - i. Sweeping compound in use
    - ii. Wet mopping or HEPA filter vacuum in use
    - iii. Protection of materials stored on site
2. Submit photos to Consultant on a monthly basis or as requested.
- G. Submit filter media cut sheets and record of installation including date and time and equipment identification.

## **PART 2 PRODUCT REQUIREMENTS**

### **2.01 FILTRATION MEDIA REQUIREMENTS**

- A. Air filter MERV (minimum efficiency reporting value) ratings shall be determined by ASHRAE 52.2-2007.
- B. Air handling equipment used during construction:
  - 1. Install new filters with a MERV of 8 (or higher) at all return/exhaust grilles/inlets before any HVAC system is operated.
- C. Air handling equipment following completion of construction and prior to occupancy:
  - 1. Install new filters with a MERV of 8 (or higher) to match base building at all return/exhaust grilles/inlets before any HVAC system is operated.
  - 2. If "Enhanced Indoor Air Quality Strategies" credit is pursued document filter installed with a MERV of 13 as a minimum.

#### **1.05 LOW EMITTING MATERIALS REQUIREMENTS**

- A. Materials must meet low emitting materials requirements as per section 01 61 00 LEED v4 Product Requirements: 2.03 -2.07.

### **PART 3 EXECUTION**

#### **3.01 INDOOR AIR QUALITY MANAGMENT PLAN**

- A. Identify potential sources of indoor air pollutants on the construction site.
  - 1. Any construction activity or material that produces odor and/or dust is considered a source of air pollutants.
    - a. Materials that produce detectable odor include, but are not limited to:
      - i. Paint
      - ii. Stains
      - iii. Sealants
      - iv. Coatings
      - v. Grouts
      - vi. Adhesives
      - vii. Epoxy Flooring
      - viii. Caulking
      - ix. Solvents

- x. Cleaning Products
  - xi. Fuels
  - xii. Pesticides
  - b. Materials that create dust include, but are not limited to:
    - i. Drywall and Drywall Compound
    - ii. Wood Products
    - iii. Acoustic Ceiling Tile
    - iv. Insulation
    - v. Ceramic Tile
    - vi. Concrete Products
  - c. Equipment that emits products of combustion or creates odor and/or dust includes, but is not limited to:
    - i. Generator
    - ii. Compressors
    - iii. Cutting Tools/Saws
    - iv. Torches/Welders
    - v. Portable Heaters
    - vi. Vehicles
  - d. Construction site activities and situations that can affect indoor air quality include, but are not limited to:
    - i. Demolition
    - ii. Renovation
    - iii. Repair
    - iv. Exterior Site Work
    - v. Standing Water
    - vi. Tobacco Smoke
- B. Minimize pollutants generated inside the building from the sources identified under above using the following measures:

1. Exhaust pollutant sources directly outside using temporary or permanent ventilation equipment. Where exhaust is not feasible, locally re-circulate air through a portable air cleaner.
  2. Designate and isolate cutting areas during relevant construction phases
  3. Collect and bag sawdust from woodworking tools
  4. Cover and/or seal all indoor sources of odour and dust
  5. Use painting techniques that minimize odour (e.g. roller instead of spraying)
  6. Use cleaning practices that minimize dust (e.g. HEPA filtered vacuum, wet mop, sweeping with compound)
  7. Use cleaning products that have low or no VOC content
  7. Use only electric-powered tools and equipment
  8. Store solvents outside the building
  9. Restrict outdoor vehicular/equipment traffic and operation where emissions can enter the building
- C. Prevent the movement of pollutants from the sources identified under article 3.01.A when possible by moving equipment, work and other pollutant sources to locations where they will have the minimum impact on indoor air quality, including by the following measures:
1. Perform pollutant generating activities off site or outside the building
  2. Set up small, contained, designated work areas to contain pollutants:
    - a. Avoid open areas and areas with high drafts
    - b. Erect dust curtains and barriers
    - c. Depressurize areas using temporary or permanent ventilation equipment
  3. Use portable fans to exhaust contaminated air to the exterior through windows, doors, etc. Ensure that adjacent windows, doors, etc. will not allow pollutants to re-enter the building.
  4. Close windows and doors adjacent to pollutant sources (e.g. dust, vehicle emissions, etc.) outside of the building. If windows and doors have not been installed, temporarily seal exterior openings with plastic.
  5. Pressurize occupied or completed areas of the building using temporary or permanent ventilation equipment.

6. Implement walk-off mats at key transition points between different areas of work
- D. Prevent the accumulation of moisture, dust and dirt on site from the sources identified under article 3.01.A using the following measures:
1. Frequently cleaning surfaces to minimize dust and dirt accumulation by:
    - a. Dusting with damp rags
    - b. Wet mopping
    - c. Sweeping using wetting agents and sweeping compounds
    - d. Vacuuming with equipment that contains HEPA filtration and/or a wet scrubber
- Note: Localized cleaning should occur immediately after a construction activity is completed and/or at the end of each day. A full site cleanup must be performed at least once a week and more often during periods of heavy dust, such as drywall taping and sanding.
2. Close exterior windows and doors or create temporary enclosures using plastic to prevent moisture accumulation indoors.
  3. Immediately remove any water accumulated indoors to protect interior surfaces and materials.
  4. Cover, seal and protect materials stored and installed on-site from moisture, dust and dirt accumulation.
  5. Elevate materials stored on site off the ground to protect from moisture and dirt accumulation.
  6. Do not install materials with evidence of moisture damage or excessive moisture accumulation.
  7. If necessary, use ventilation/dehumidification to control humidity levels within the building.
  8. Promptly clean all spills (water, fuels, lubricants, paints, adhesives, etc.).
  9. Clean or remove excess application of solvent-containing products.
- E. Protect HVAC systems and components using the following measures:
1. Cover (with plastic) and elevate (off ground) all ductwork, fittings, insulation, acoustic lining and equipment stored on site during construction.
  2. Seal all supply, return and exhaust openings as well as all temporary ductwork openings not under immediate work (e.g. open ends in ductwork runs) with plastic. Openings must be sealed immediately after installation in areas that will no longer be under work.



3. Close/cover all hatches and access doors in HVAC equipment that will not be under work.
  4. Seal all HVAC equipment openings (e.g. inlets/outlets of air handlers, fans, VAV boxes, etc.) with plastic until ductwork is connected.
  5. Do not use mechanical rooms to store or collect construction waste materials.
  6. Install ceiling tiles and seal all openings into the plenum with plastic prior to final cleaning.
- F. It is recommended that permanent HVAC equipment is not used during construction if possible. Provide temporary ventilation as follows:
1. Where possible, use temporary ventilation directly exhausted to the outdoors.
  2. Supply 100% outside air where possible.
  3. Seal all openings in HVAC systems, ductwork and plenums as described above.
  4. If permanent HVAC equipment is used during construction without protection measures being implemented the Contractor must provide duct cleaning services, plus all necessary access doors, at no extra cost to the contract.
- G. If permanent HVAC equipment must be used during construction.
1. Install new filters in all air handling equipment as per Section 2 above before any HVAC system is operated. Provide a duct-mounted filter (external to equipment) if necessary.
  2. Temporarily shut down the return/exhaust side of HVAC systems during heavy construction/demolition.
  3. Close off the return/exhaust side of HVAC systems in areas with high levels of contaminants. Cover duct openings with plastic in these areas.
  4. Supply 100% outside air where possible. Do not recirculate contaminated air.
  5. If HVAC equipment is operated without the above protection measures in place, the Contractor must provide duct cleaning services, plus all necessary access doors, at no extra cost to the contract.
- H. After all construction and final cleaning work is complete the Contractor shall:
1. Remove all HVAC protection measures
  2. Install new filters in all air handling equipment as per paragraph 2.01
  3. Startup systems
  4. Prepare systems for Testing, Adjusting and Balancing Contractor and Commissioning Agent.

### **3.02 SEQUENCE OF FINISH INSTALLATION**

- A. Project schedule shall address construction scheduling/sequencing requirements and procedures necessary to optimize Indoor Air Quality (IAQ) levels for the completed Project.
  - 1. Contractor's Project Schedule for finish applications shall allow for:
    - a. Dissipation of emissions from finish materials that off-gas deleterious materials during curing.
    - b. Separation of absorptive finishes from any potential contaminants during material storage and installation.
    - c. Sequencing installation of materials to comply with IAQ requirements of this Section.
- B. Contractor shall follow procedures for temporary ventilation in the affected area as specified in this Section and in Division 23 Sections for all areas, including areas within occupied space.
- C. Contractor shall provide duct cleaning as specified in this Section and in Division 23 Sections.
- D. Contractor shall seal off affected areas within occupied space with slab-to-slab temporary partitions that provide a barrier for dust, debris and fumes.
- E. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing processor installation techniques, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing. Type 1 Finishes include, but are not limited to the following:
  - 1. Composite wood products, specifically including particleboard from which millwork, wood paneling, doors or furniture may be fabricated
  - 2. Adhesives, sealants, and glazing compounds, specifically those with petrochemical vehicles or carriers
  - 3. Wood preservatives, finishes, and paint
  - 4. Control and/or expansion joint fillers
  - 5. All hard finishes requiring adhesive installation
  - 6. Gypsum board and associated finish processes
  - 7. Resilient flooring

- F. Type 2 Finishes: Absorbent materials and finishes which are woven, fibrous, or porous in nature and tend to absorb chemicals off-gassed by Type 1 Finishes or which may be adversely affected by particulates. Type 2 Finishes include, but are not limited to the following:
1. Carpet and padding
  2. Fabric wallcovering
  3. Insulation exposed to the air stream
  4. Acoustic ceiling materials
  5. Fabric covered acoustic wall panels
  6. Upholstered furnishings
- G. Materials that can be categorized as both Type 1 and Type 2 Finishes shall be treated as Type 1 Finishes.
- H. Materials that are categorized as neither Type 1 nor Type 2 are not bound by the requirements of this Section.
- I. Contractor shall submit Supplementary Construction Schedule showing compliance with requirements of this Section as a supplement to the project schedule.
1. Indicate sequence of finishes applications and allowances for curing times. Within each air zone, identify finishes, indicating their type classification as defined above.
  2. An air zone is that part of any floor area served by a single air handling unit. Contractor's schedule must address controls in each air zone.
  3. Indicate and schedule types and duration of temporary ventilation proposed. Show schedule for commissioning procedures and all temporary usage of building mechanical systems, identifying types of filtration used and schedule of filter replacement.
- J. The Contractor shall schedule and coordinate the work of all finish material installers to assure compliance with the requirements of this specification section.
- K. Finish materials that are stored prior to installation shall be stored in such a manner that air-borne chemical and/or particulate contaminants cannot be transferred from Type 1 Finishes to Type 2 Finishes.
- L. Substrate materials which must be in-place before installation of any Type 1 Finish are exempt from sequencing requirements defined below. Ventilation requirements are not exempt for this condition.
- M. Install Type 1 Finishes in a manner compliant with the following:

1. Allow wet-applied Type 1 Finishes to fully cure prior to commencing installation of absorbent materials, whether Type 1 or Type 2.
  2. Install all Type 1 Finishes prior to commencing installation of Type 2 Finishes.
  3. Allow Type 1 materials that are known to off-gas deleterious vapors, whether due to manufacturing processes or installation techniques, to fully cure prior to installation of Type 2 Finishes. Such materials can include, but are not limited to: composite wood, carpet and cushion, resilient flooring, etc.
  4. Remove particulate matter from interior space (whether air-borne or on a surface) prior to installation of Type 2 Finishes.
  5. Comply with all ventilation requirements as required by this Section and identified below.
- N. Install Type 2 Finishes in a manner compliant with the following:
1. Do not install Type 2 Finishes until installation of Type 1 Finishes is complete and adequate time for curing has been allowed.
  2. Protect Type 2 Finishes from contamination by chemical off-gassing and/or air-borne particulates during and subsequent to installation.
  3. Avoid installation of Type 1 Finishes during Type 2 Finish installation period.
  4. Comply with all ventilation requirements as required by this Section and identified below.
- O. If Contractor's Project Schedule requires sequencing of finish installation that does not comply with this Section, provide the following for such period of construction during which sequencing is non-compliant:
1. Provide supplemental ventilation of work areas following guidelines described in 3.01.
  2. If permanent mechanical systems must be used follow the requirements of Section 3.01.G.
- P. Provide and maintain controlled interior environment prior to and during installation of interior finish materials.
- Q. Refer to this section, Division 23 specifications, and Sections 01 81 00 and 01 91 00 for pre-commissioning and commissioning procedures for HVAC systems, including duct cleaning and filter replacement prior to release of the Project to the Owner for occupancy.

### **3.03 INSPECTIONS AND MAINTENANCE**

- A. The Contractor shall inspect all indoor air quality management measures and remedy any deficiencies on a weekly basis.
  - 1. Inspections shall be recorded in the IAQ Management Inspection Log and shall denote the measures implemented at the time of inspection, any deficiencies as well as corrective actions taken.
  - 2. Provide weekly date stamped photos as per Section 1.07 to document continuous compliance.
- B. All Pollutant Containment, Housekeeping and HVAC protection measures will be reviewed by the Consultant periodically.
  - 1. All deficiencies identified by the Consultant must be remedied and documented in the IAQ Management Inspection Log within 48 hours of notification.
  - 2. The Contractor shall clean or replace any equipment or materials that is incorrectly stored or improperly protected at no extra cost to the contract.

#### **3.04 REMOVAL OF PROTECTION MEASURES**

- A. All products/materials installed as a part of indoor air quality management measures shall be removed prior to building turnover. Any remedial work required as a result of removing the measures is the responsibility of the Contractor.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 APPLICABLE STANDARDS**

- .1 Applicable Standards are listed below:
  - .1 ASHRAE Standard 202-2024 - The Commissioning Process Requirements for New Buildings and New Systems
  - .2 ASHRAE Standard 230-2022 - Commissioning Process for Existing Buildings and Systems
  - .3 ASHRAE Guideline 0-2019 - the Commissioning Process
  - .4 ASHRAE Guideline 0.2-2015 - Commissioning Process for Existing Systems and Assemblies
  - .5 ASHRAE Guideline 1.1-2025 - Application of the Commissioning Process to New HVAC&R Systems
  - .6 ATSM E2813 – Standard Practice for Building Enclosure Commissioning
  - .7 ATSM E2947 – Standard Guide for Building Enclosure Commissioning
  - .8 CaGBC LEED v4.1 Building Design and Construction Reference Guide
    - .1 LEED EAp1: Fundamental Commissioning and Verification
    - .2 LEED EAac1: Option 1. Path 1: Enhanced Commissioning
  - .9 CSA Z320-11 Building Commissioning Standard & Check Sheets
  - .10 CSA C282-15 – Emergency Power Supply for Buildings
  - .11 NIBS Guideline 3-2012 – Building Enclosure Commissioning Process

### **1.3 DESCRIPTION**

- .1 Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. The commissioning process begins in the design phase and continues through construction, acceptance and the warranty period. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, functional testing and training.
- .2 Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
  - .1 Verify that applicable equipment and systems, and envelope assemblies are installed according to the manufacturer's recommendations and industry best practices, and that they receive adequate operational checkout by installing subcontractors.
  - .2 Verify and document proper performance of equipment and systems.
  - .3 Verify that O&M documentation left on site is complete.

- .4 Verify that the Owner's operating personnel are adequately trained.
- .3 The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

#### 1.4 ABBREVIATIONS

- .1 The following are common abbreviations used in the Commissioning Specifications:

CxA	Commissioning Authority	FT	Functional Test
CC	Controls Subcontractor	GC	General Contractor
PM	Project Manager	MC	Mechanical Subcontractor
Cx	Commissioning	PFT	Pre-functional test
EC	Electrical Subcontractor	Subs	Subcontractors to the General Contractor
FM	Facility Management	TAB	Test and Balance Subcontractor

#### 1.5 COORDINATION

- .1 Commissioning Team. The commissioning team consists of the representatives from the Owner/ Owner's Project Manager (PM), the Facility Management (FM) Staff, Commissioning Authority (CxA), the General Contractor (GC), the Consultant (Architect, Design Engineers), the Mechanical Subcontractor (MC), the Electrical Subcontractor (EC), the Testing and Balancing (TAB) Subcontractor, the Controls Subcontractor (CC), Specialty Subcontractors (including Building Envelope Subcontractors) and any other installing subcontractors or suppliers of equipment.
- .2 Management. The CxA is hired by the Owner and follows the rules of an Independent Commissioning Authority. The CxA directs and coordinates the commissioning activities and reports to the Owner or the Project Manager (PM). All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.
- .3 Scheduling. The CxA will work with the Owner/PM and GC according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the Owner/PM and GC for scheduling commissioning activities. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process. The CxA will work with the GC to provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The Commissioning Plan provides a format for this schedule. As construction progresses more detailed schedules are developed by the GC and the CxA. The Commissioning Plan also provides a format for detailed schedules.

#### 1.6 COMMISSIONING PROCESS

- .1 Commissioning Plan. The CxA develops a commissioning plan which provides guidance in the execution of the commissioning process. The Commissioning Plan details the commissioning process; activities, deliverables in a logical, sequential order, and details roles and responsibilities of parties involved in Cx. Following the commissioning scoping meeting, the CxA will update the

plan which is then considered the “final” plan, though it will continue to evolve and expand as the project progresses. The Specifications will take precedence over the Commissioning Plan.

- .2 Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.
  - .1 Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.
  - .2 Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
  - .3 Equipment documentation is submitted to the CxA during normal submittals, including detailed start-up procedures and shop drawings.
  - .4 Mock-up tests are executed by subs on required envelope assemblies.
  - .5 The CxA oversees startup plans and startup documentation formats prepared by the Subs. The CxA provides the Subs with pre-functional test sheets to be completed during the startup process.
  - .6 In general, the checkout and performance verification proceeds from simple to complex; from component level, to equipment, to systems, and finally intersystem levels with pre-functional test sheets being completed before functional testing.
  - .7 The Subs, under their own direction, execute and document the pre-functional test sheets and perform startup and initial checkout. The CxA documents that the test sheets and startup were completed according to the approved plans. This may include the CxA witnessing start-up of selected equipment.
  - .8 The Subs complete all testing required prior to functional testing by the CxA including pre-functional, start-ups, duct leakage, pipe pressure testing, balancing, controls verification and any other test as required by the specifications.
  - .9 The CxA develops specific equipment and system functional performance test procedures with the assistance of Subs as required. The Subs review the test procedures once prepared.
  - .10 The procedures are executed by the Subs, under the direction of, and documented by the CxA.
  - .11 Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
  - .12 The CxA reviews the O&M documentation and training plan for completeness.
  - .13 The CxA provides final commissioning documentation including LEED closeout documents.
  - .14 Commissioning is completed before Substantial Completion.
  - .15 Deferred/ Seasonal testing is conducted, as specified or required.
  - .16 Warranty review is conducted to review facility operation



## 1.7 RELATED WORK

- .1 Specific commissioning requirements are given in the following sections of these specifications.  
All of the following sections apply to the Work of this section.

01 91 00	Commissioning Requirements	Describes the commissioning process, responsibilities common to all parties, responsibilities of the Consultant, CxA, GC and Suppliers, focusing on the CxA. The unique Subcontractor responsibilities are included in Divisions 7, 8, 22, 23, 25 and 26.
01 91 19	Building Envelope Commissioning	Describes the Cx responsibilities of the GC and appropriate Subs, and the mock-up assembly testing, pre-functional and building envelope testing responsibilities. Points to 01 91 00 and provides specific mock-up and building envelope testing requirements for Divisions 7 & 8 components/ assemblies for use on this project.
22 08 00	Plumbing System Commissioning	Describes the Cx responsibilities of the Fire Suppression, Plumbing, Mechanical, TAB and Controls Subcontractors and the pre-functional testing and startup responsibilities of each.  Points to 01 91 00 for functional testing requirements and provides the pre-functional and the specific functional testing requirements for Division 22, 23 and 25 equipment, for use on this project.
23 08 00	HVAC System Commissioning	
25 08 00	Integrated Automation Commissioning	
26 08 00	Electrical Work Commissioning	Describes the Cx responsibilities of the Electrical, Contractor and the pre-functional testing and startup responsibilities.  Provides the pre-functional and the specific functional testing requirements for Division 26 equipment, for use on this project. Points to Section 01 91 00.

## 1.8 DEFINITIONS

- .1 The following are definitions for terms used in the commissioning Specifications
- .1 Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.
  - .2 Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The

- basis of design describes the systems, components, conditions and methods chosen to meet the intent. The basis of design is the technical response to the design intent.
- .3 Building Envelope Testing - Performance testing of installed building envelope systems, components and materials including water leakage, air leakage, water penetration, joint adhesion, thermal imaging etc.
  - .4 Commissioning Authority (CxA) – The CxA works independent of the design and constructions teams. The CxA directs and coordinates the day-to-day commissioning activities. The CxA does not take an oversight role like the Consultant. The CxA is part of the Owner's team or shall report directly to the Owner/PM.
  - .5 Commissioning Plan - an overall plan that details the commissioning process; activities and deliverables, outlines general roles and responsibilities the commissioning team, and details coordination planning for the commissioning process.
  - .6 Contract Documents - the documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts etc.).
  - .7 Consultant – the prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical, electrical, structural etc. designers/engineers.
  - .8 Contract – the undertaking by the parties to perform their respective duties, responsibilities and obligations and prescribed in the Contract Documents and represents the entire agreement between the parties.
  - .9 Control system - the central building energy management control system.
  - .10 Data-logging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone data-loggers separate from the control system.
  - .11 Deferred Functional Tests – FT's that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.
  - .12 Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not compliant with the design intent).
  - .13 Design Intent (Owner's Project Requirements) - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the Owner. It is initially the outcome of the programming and conceptual design phases.
  - .14 Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.
  - .15 Drawings – the graphic and pictorial portions of the Contract Document, showing the design, location and dimensions of the work, generally including plans, elevations, sections, details and diagrams
  - .16 Factory Testing - testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.
  - .17 Functional Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is

- tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB Contractor's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The Commissioning Authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing subcontractor or vendor. FTs are performed after pre-functional test sheets and startup are complete.
- .18 General Contractor (GC) – the prime contractor for this project. Generally, refers to all the GC's subcontractors as well.
  - .19 Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
  - .20 Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data-loggers or the trending capabilities of control systems.
  - .21 Non-Compliance - see Deficiency.
  - .22 Mock Up - A full sized physical assemblies of a structure (for purposes of this document, building envelope components/ assemblies) that are constructed on-site for study, demonstration and testing. A mock-up is a prototype used to demonstrate aesthetic effects, and to display functionality of a system which enables testing of a design including interfaces between dissimilar materials.
  - .23 Non-Conformance - see Deficiency.
  - .24 Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."
  - .25 Owner-Contracted Tests - tests paid for by the Owner outside the GC's contract and for which the CxA does not oversee. These tests will not be repeated during functional tests if properly documented.
  - .26 Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.
  - .27 Pre-functional Tests (PFT's) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Pre-functional test sheets are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels satisfactory, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). Pre-functional refers to before functional testing and are to be completed by the installing subcontractor. Pre-functional test sheets augment and are combined with the manufacturer's

- start-up checklist. The CxA may choose to witness pre-functional tests for large/critical pieces of equipment.
- .28 Project Manager (PM) - the Owner's representative in the day-to-day activities
  - .29 Sampling. - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 01 91 00, Part 3.10.10.8 for details.
  - .30 Seasonal Performance Tests - FT's that are deferred until the system(s) will experience conditions closer to their design conditions.
  - .31 Shop Drawings – drawings, diagrams, illustrations, schedules, performance charts, brochures, product data, and other data which the General Contractor provides to illustrate details of portions of the Work.
  - .32 Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).
  - .33 Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.
  - .34 Specifications - the construction specifications of the Contract Documents.
  - .35 Startup - the initial starting or activating of dynamic equipment, including executing pre-functional test sheets.
  - .36 Subs – the Subcontractors to the General Contractor; a person or identity having direct contract with the General Contractor to perform a part or parts of the Work.
  - .37 Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.
  - .38 Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents
  - .39 Trending - monitoring using the building control system.
  - .40 Vendor - supplier of equipment.
  - .41 Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

## **1.9 SYSTEMS TO BE COMMISSIONED**

- .1 Systems to be commissioned may include, but may not limited, to the following:
  - .1 Mechanical. including HVAC & R equipment and controls
  - .2 Plumbing, including domestic hot water systems, pumps and controls
  - .3 Electrical, including service, distribution, lighting and controls including daylighting controls
  - .4 Building Automation System
  - .5 Building Envelope

- .6 Energy and water submeters

## **PART 2 – PRODUCTS**

### **2.1 TEST EQUIPMENT**

- .1 The Contractor shall ensure all standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division Subcontractor for the equipment being tested. For example, the HVAC Subcontractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls systems except for equipment specific to and used by TAB in their commissioning responsibilities.
- .2 Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Subcontractor and left on site, except for stand-alone datalogging equipment that may be used by the CxA.
- .3 Data-logging equipment and software required to test equipment will be provided by the CxA but shall not become the property of the Owner.
- .4 All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to accuracy of 0.28deg.C (0.5deg.F) and a resolution of  $\pm 0.056\text{deg.C}$  (0.1deg.F). Pressure sensors shall have an accuracy of  $\pm 2.0\%$  of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

## **PART 3 – EXECUTION**

### **3.1 GENERAL COMMISSIONING RESPONSIBILITIES**

- .1 The general responsibilities of various parties in the commissioning process are provided in the following subsections. Additional responsibilities of the GC and appropriate Subs are in Division 7-8, Mechanical and TAB Contractors are in Division 22 and 23, Controls Subcontractor are in Division 25 and those of the Electrical Subcontractor in Division 26.
- .2 All members of the commissioning team shall attend the commissioning scoping meeting and additional meetings, as necessary.

### **3.2 CONSULTANT (ARCHITECT/ ENGINEERS) COMMISSIONING RESPONSIBILITIES**

- .1 Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One site observation should be completed just prior to system startup.
- .2 Provide any design narrative and sequences documentation requested by the CxA. The Designers shall assist (along with the Contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
- .3 Attend commissioning scoping meetings and other selected commissioning team meetings.

- .4 Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
- .5 Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review the O&M manuals.
- .6 From the Subcontractor's red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic water, steam and condensate systems; supply, return and exhaust air systems and emergency power system.
- .7 Provide a presentation at one of the training sessions for the Owner's personnel.
- .8 Witness testing of selected pieces of equipment and systems.
- .9 Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.

### **3.3 COMMISSIONING AUTHORITY RESPONSIBILITIES**

- .1 The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the General Contractor and the Consultant. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA.
- .2 Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
- .3 Coordinate the commissioning work and, with the GC ensure that commissioning activities are being scheduled into the master schedule.
- .4 Develop and issue the Commissioning Plan.
- .5 Plan and conduct a commissioning scoping meeting and other commissioning meetings.
- .6 Before startup, review the current control sequences and interlocks and work with Contractors and Consultants until sufficient clarity has been obtained, in writing, to be able to write detailed functional testing procedures.
- .7 Review Subcontractor submittals applicable to systems being commissioned. Request and review additional information required to perform commissioning tasks, including O&M materials, subcontractor start-up and checkout procedures.
- .8 Prepare pre-functional tests and test sheets.
- .9 Perform site visits, as necessary, to observe component and system installations, start-ups, to inspect envelope assemblies etc. Review construction meeting minutes for

revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.

- .10 Review HVAC piping test and flushing reports and ductwork testing reports. Notify the Owner/PM and/or Consultant of any deficiencies in results or procedures.
- .11 Approve pre-functional tests and checklist completion by reviewing pre-functional checklist reports and by selected site observation and spot checking.
- .12 Approve systems start-up by reviewing start-up reports and by selected site observation.
- .13 Review testing reports of the control system
- .14 Review air and water balancing by reviewing reports and spot checking during functional testing.
- .15 Witness/ review contractor electrical testing (ex. generator, ATS, lighting control). Notify the Owner/PM and/or Consultant of deficiencies in results or procedures.
- .16 Witness performance testing of building envelope components/ assemblies executed by building envelope subcontractors and testing agencies. Review completed test sheets.
- .17 With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and system. This may include energy management control system trending, stand-alone data-logger monitoring, or manual functional testing.
- .18 Analyze any functional performance trend logs and monitoring data to verify performance.
- .19 Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved. Perform actual functional testing with contractors on equipment to be commissioned.
- .20 Maintain a master deficiency and resolution log and a separate testing record.
- .21 Review the preparation of the O&M manuals.
- .22 Verify the training program for the Owner's operating personnel.
- .23 Provide a Final Commissioning Report and Commissioning Record.
- .24 .Provide LEED required commissioning close-out documents.
- .25 Return to site prior to the end of the warranty period and review with facility staff the current building operation and identify any problems or concerns. Provide a report with recommendations and identify areas that may come under warranty or under the original construction contract.

### **3.4 OWNER/ PROJECT MANAGER COMMISSIONING RESPONSIBILITIES**

- .1 Facilitate the coordination of the commissioning work by the CxA.
- .2 Review the final Commissioning Plan.
- .3 Attend a commissioning scoping meeting and other commissioning team meetings.
- .4 Furnish a copy of all construction documents, addenda, change orders related to commissioned equipment to the CxA.
- .5 Observe and witness mock-ups (if required), pre-functional test sheets, startup and functional testing and building envelope testing, at their discretion.

- .6 Review commissioning progress and deficiency reports.
- .7 Assist in coordinating the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
- .8 Review commissioning test results.
- .9 Coordinate attendance of owner personnel for training sessions.
- .10 Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the Final Commissioning Program.
- .11 Assist the CxA as necessary in coordinating the seasonal or deferred testing and deficiency corrections required by the specifications.

### **3.5 GENERAL CONTRACTOR COMMISSIONING REQUIREMENTS**

- .1 Facilitate the coordination of the commissioning work by the CxA, and coordinate with the Subs to ensure support throughout commissioning. Ensure that commissioning activities are being scheduled into the master schedule.
- .2 Review the final Commissioning Plan.
- .3 Attend a commissioning scoping meeting and other commissioning team meetings.
- .4 Include all cost associated with commissioning in the total contract price.
- .5 Perform the normal review of Subcontractor submittals.
- .6 Furnish a copy of all approved submittals and Shop Drawings related to commissioned equipment to the CxA.
- .7 In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
- .8 Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
- .9 Observe mock-ups, pre-functional test sheets, startup and functional testing, specialty system testing and building envelope performance testing at their discretion.
- .10 Review commissioning progress and deficiency reports.
- .11 Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
- .12 Sign-off on individual commissioning tests as completed and passing.
- .13 Provide, coordinate and schedule all required training of owner personnel. See 3.14 of this specification 01 91 00 for more information.
- .14 Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
- .15 Ensure that Subs execute seasonal or deferred functional performance testing, witnessed by the CxA, according to the specifications.



- .16 Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

### **3.6 EQUIPMENT SUPPLIER COMMISSIONING RESPONSIBILITIES**

- .1 Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
- .2 Assist in equipment testing per agreements with Subs, which may include factory tests and the development of associated reports.
- .3 Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to Contract Documents in the base bid price to the Subcontractor, except for stand-alone data-logging equipment that may be used by the CxA.
- .4 Through the Contractors and subs they supply products to, analyze specified products and verify that the Consultant has specified the newest most updated equipment reasonable for this project's scope and budget.
- .5 Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
- .6 Review test procedures for equipment installed by factory representatives.

### **3.7 MEETINGS**

- .1 The CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to create the Commissioning Plan to its "final" version, which will also be distributed to all parties.
- .2 Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CxA will plan these meetings and will minimize unnecessary time being spent by Subs.

### **3.8 REPORTING**

- .1 The CxA will provide regular updates to the PM and/or Owner, depending on the management structure, with increasing frequency as construction and commissioning progresses.
- .2 The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes.
- .3 Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.
- .4 A final commissioning summary report developed by the CxA will be provided to the PM and/or the owner, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. Pre-functional test sheets and functional tests will be appended to the summary report and combined with the executed Commissioning Program to form the Commissioning Record.

### **3.9 SUBMITTALS**

- .1 The Contractors shall ensure it's Subcontractors provide the CxA standard submittals required to facilitate the commissioning work. This process will be integrated into the normal submittal process and protocol of the construction team. At a minimum, the submittals will include equipment, system, building envelope and controls related shop drawings, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings, and details of owner contracted tests. In addition, the installation and checkout materials that are shipped inside the equipment and the field checkout forms to be used by the factory or field technicians shall be submitted to the CxA. All documentation requested by the CxA will be included by the Subs in their O&M manual contributions.
- .2 The CxA will review submittals related to the commissioned equipment for use in the development of functional test procedures.
- .3 The CxA may request additional design narrative from the Consultant and Controls Subcontractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.
- .4 These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the GC, though the CxA will review them.

### **3.10 MOCK-UP, START-UP, PRE-FUNCTIONAL TEST SHEETS AND INITIAL CHECKOUT**

- .1 The following procedures apply to the appropriate mechanical and electrical equipment and building envelope components to be commissioned. Some systems that are not comprised so much of actual dynamic machinery (e.g. electrical system power quality) may have very simplified PFTs and startup.
  - .1 Mock-Up Tests. As required, mock-up tests are developed and executed by others (subs). The mock-up tests including the testing of a prototype or replica of the building envelope components/ assemblies to verify performance prior to full scale construction.
  - .2 Start-up and Initial Checkout Plan. The CxA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for pre-functional test sheets and startup are identified in the commissioning scoping meeting and in the checklist forms. The parties responsible for executing functioning performance testing are detailed in specific commissioning specification sections (refer to Section 01 91 00 subsection 1.6 of this document for details).
  - .3 Pre-functional Tests. PFTs are generally provided by the CxA to the GC. The GC determines which Subcontractor is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution. Pre-functional tests are a critical commissioning piece in order to ensure functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout. No sampling strategies are used. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.
  - .4 The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CxA's test sheets with the manufacturer's detailed start-

- up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include test sheets and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:
- .5 The CxA's pre-functional test sheets.
  - .6 The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
  - .7 The manufacturer's normally used field checkout sheets.
  - .8 The subcontractor submits the full startup plan to the CxA for review.
  - .9 The CxA reviews the procedures and the format for documenting them, noting any procedures that need to be added.
  - .10 The full start-up procedures and the approval form may be provided to the PM for review depending on management protocol.
- .2 Sensor and Actuator Calibration:
- .1 All field-installed temperature, relative humidity, CO/CO<sub>2</sub>, and pressure sensors/gauges, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if accepted by the Owner in advance. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
  - .2 All procedures used shall be fully documented on the pre-functional test sheets or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.
- .3 Sensor Calibration Methods:
- .1 All Sensors Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure.
  - .2 Sensors Without Transmitters--Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or Building Automation System (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.
  - .3 Sensors With Transmitters--Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset

relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or BAS) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

#### .4 Tolerances, Standard Applications

.1 The following tolerances shall apply unless superseded in the contract documents.

SENSOR	REQ TOLERANCE [+/-]	SENSOR	REQ TOLERANCE [+/-]
Cooling coil, chilled and condenser water temps	0.22°C (0.4°F)	Flow rates, water	4% of design
AHU wet bulb or dew point	1.11°C (2.0°F)	Relative humidity	4% of design
Hot water coil and boiler water temp	0.83°C (1.5°F)	Combustion flue temps	2.78°C (5.0°F)
Outside air, space air, duct air temps	0.22°C (0.4°F)	Oxygen or CO <sub>2</sub> monitor	0.1 % pts
Watt hour, voltage & amperage	1% of design	CO monitor	0.01 % pts
Pressures, air, water and gas	3% of design	Natural gas and oil flow rate	1% of design
Flow rates, air	10% of design	Steam flow rate	3% of design
		Barometric pressure	338.639 Pa (0.1 in. of Hg)

#### .2 Valve and Damper Stroke Setup and Check:

- .1 BAS Readout For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- .2 Closure for heating coil valves (NO): Set heating setpoint 11.11°C (20°F) above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 11.11°C (20°F) below room temperature. Observe the valve close. Restore to normal.
- .3 Closure for cooling coil valves (NC): Set cooling setpoint 11.11°C (20°F) above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 11.11°C (20°F) below room temperature. Observe valve open. Restore to normal.

.3 Execution of Pre-functional Test Sheets and Startup:

- .1 Four weeks prior to startup, the Subs and suppliers schedule startup and checkout with the Owner/PM, Consultant, GC and CxA. The performance of the pre-functional test sheets, startup and checkout are directed and executed by the Sub or supplier. When checking off pre-functional test sheets, signatures may be required of other Subs for verification of completion of their work.
- .2 The CxA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as accepted by the Owner/PM).
- .3 For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CxA shall observe a sampling of the pre-functional and start-up procedures.
- .4 The Contractor shall ensure the Subs and vendors execute startup and provide the CxA with a signed and dated copy of the completed start-up and pre-functional tests and test sheets.
- .5 Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

.4 Deficiencies, Non-Conformance and Approval in Test Sheets and Startup:

- .1 The Contractor shall ensure the Subs clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.
- .2 The CxA reviews the report and submits either a non-compliance report or an approval form to the Sub or PM. The CxA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CxA will involve the PM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the test sheets and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA recommends approval of the execution of the test sheets and startup of each system to the Owner/PM and Consultant using a standard form.

### **3.11 FUNCTIONAL TESTING**

- .1 This sub-section applies to all commissioning functional testing for all divisions.
- .2 Systems to be Commissioned: The list of equipment to be commissioned is detailed in specific commissioning specification sections (refer to Section 01 91 00 subsection 1.8 of this document for details).
- .3 Objectives and Scope: The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

- .4 In general, each system should be operated through all modes of operation (where applicable). Verifying each sequence in the sequences of operation is required, as well as verifying correct response to failure scenarios.
- .5 Development of Test Procedures: Before test procedures are written, the CxA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in specific commissioning specification sections (refer to Section 01 91 00 subsection 1.6 of this document for details), the CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of M&E equipment and system including controls. The Contractor shall ensure that each Sub or vendor responsible to execute a test, provides limited assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA may submit the tests to the Consultant for review, if requested.
- .6 Building Envelope Test procedures: Test development for the building envelope components/assemblies shall be joint responsibility of the appropriate sub or installing contractor and CxA. The test forms shall be executed on site by the appropriate parties as per contract. Building envelope tests developed/ executed by Building Envelope Subcontractors and Testing Agencies may be witnessed by the CxA as appropriate, and completed test forms shall be provided to the CxA and commissioning team. The CxA shall provide sign off on for these systems once the tests have been proven satisfactory, and all deficiencies have been resolved.
- .7 The CxA shall review owner-contracted, factory testing or required owner acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.
- .8 The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.
- .9 The test procedure forms developed by the CxA for M&E shall include (but not be limited to) the following information:
  - .1 System and equipment or component name(s)
  - .2 Equipment location and ID number
  - .3 Date
  - .4 Project name
  - .5 Participating parties
  - .6 A copy of the specification section describing the test requirements
  - .7 A copy of the specific sequence of operations or other specified parameters being verified
  - .8 Required pre-test field measurements (filled-up pre-functional tests)
  - .9 Instructions for setting up the test.
  - .10 Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format

- .11 Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
- .12 A section for comments
- .13 Signatures and date block for the CxA and all participating parties.
- .10 Test Methods:
  - .1 Test Execution: Functional performance testing may be achieved by manual testing (persons manipulate the equipment or simulate conditions and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities. The CxA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the Owner/PM or Consultant. This may require a change order and adjustment in charge to the Owner. The CxA will determine which method is most appropriate for tests that do not have a method specified.
  - .2 Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
  - .3 Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
  - .4 Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
  - .5 Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55°F, when the outside air temperature is above 55°F, temporarily change the lockout setpoint to be 2°F above the current outside air temperature.
  - .6 Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during pre-functional testing.
  - .7 Setup: Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Contract shall ensure that the Sub executing the test provides all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.
  - .8 Sampling: Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and

significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. It is noted that no sampling by Subs is allowed in pre-functional checklist execution. Sampling strategies will be determined at the discretion of the CxA with approval by the Owner/PM and or Consultant.

- .9 If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA will stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.
- .11 Coordination and Scheduling:
  - .1 The Contractor shall ensure the Subs provide sufficient notice to the CxA regarding their schedule for mock-up testing, completion of pre-functional test sheets, startup of all equipment and systems, and building envelope testing. The CxA will schedule functional tests through the Owner/PM, GC and affected Subs. The CxA shall direct, witness and document the functional testing of mechanical and electrical equipment and systems. The Subs shall execute the tests.
  - .2 In general, functional testing is conducted after pre-functional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.
  - .3 Test Equipment: Refer to Section 01 91 00, Part 2 for test equipment requirements. The Contractor shall ensure that the equipment required for building envelope commissioning tests will be provided by the party executing the applicable test.
  - .4 Problem Solving: The CxA will recommend solutions to problems found, however it is the responsibility of the Consultant, Subs, and the GC to solve, correct and retest problems.

### **3.12 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS**

- .1 Documentation: The CxA shall witness and document the results of functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the Owner/PM, Consultant and Subs for review. The CxA will include the filled out forms in the Commissioning Record.
- .2 Non-Conformance:
  - .1 All deficiencies or non-conformance issues shall be noted and reported to the Owner/PM and communicated to the Consultant and GC on a standard non-compliance form.
  - .2 Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
  - .3 Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be



- pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues.
- .4 Any deficiencies identified during mock-up testing shall be rectified prior to proceeding with construction of that component
  - .5 As tests progress and a deficiency is identified, the CxA discusses the issue with the executing subcontractor and the Contractor.
    - .1 When there is no dispute on the deficiency and the Sub accepts responsibility to correct, the following course of action occurs:
      - .2 The CxA documents the deficiency in deficiency tracking log and issues to the Project Team. The Sub corrects the issue and signs off on the deficiency tracking log indicating the issue has been resolved
      - .3 The CxA reschedules the test and the test is repeated. If the test is successful, the CxA closes the item.
    - .6 If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
      - .1 The deficiency shall be documented on the deficiency tracking log with the Sub's response and a copy given to the Owner/PM, Consultant and to the Contractor and Sub representative assumed to be responsible.
      - .2 Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the Consultant. Final acceptance authority is with the Owner/Project Manager.
      - .3 The CxA documents the resolution process.
      - .4 Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs off on the deficiency tracking log and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved, at which time the CxA closes the item.
  - .7 Cost of Retesting:
    - .1 The Contractor shall be responsible for the cost of the Sub to retest a Pre-functional or functional test if they are responsible for the deficiency. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
    - .2 For a deficiency identified, not related to any Pre-functional checklist or start-up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CxA's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
    - .3 The time for the CxA to direct any retesting required because a specific Pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty Pre-functional test.
    - .4 Refer to the sampling section of Section 01 91 00, Part 3.10 for requirements for testing and retesting identical equipment.

- .8 The GC shall respond in writing to the CxA and Owner/PM and/or Consultant at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
- .9 The CxA retains the original deficiency tracking log until the end of the project.
- .10 Any required retesting by any subcontractor shall not be considered a justified reason for a claim of delay or for a time extension by the GC.
- .3 Approval:
  - .1 The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA and by the Owner/PM and/or the Consultant, if necessary. The CxA recommends acceptance of each test to the PM using a standard form. The Owner/PM gives final approval on each test using the same form, providing a signed copy to the CxA and the GC.

### **3.13 OPERATION AND MAINTENANCE MANUALS**

- .4 The specific content and format requirements for the standard O&M manuals are detailed in Mechanical & Electrical Specifications by the Consultants. ASHRAE Guideline 4-2008 is the recommended format.
- .5 The CxA shall review the O&M manuals, documentation and as-builts for systems that were commissioned and to verify compliance with the Specifications. The CxA will communicate deficiencies in the manuals to the Owner/PM or Consultant. Upon a successful review of the corrections, the CxA recommends acceptance of these sections of the O&M manuals to the Owner/PM or Consultant. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the Consultant's review of the O&M manuals according to the Consultant's contract.

### **3.14 TRAINING OF OWNER PERSONNEL**

- .1 The GC shall be responsible for training coordination and scheduling, and ultimately for ensuring that training is completed for commissioned equipment.
- .2 The GC shall interview the Owner's FM staff and Consultant to determine the special needs and areas where training will be most valuable. The Owner/PM and Consultant with input from the CxA as required shall decide how rigorous the training should be for each piece of commissioned equipment. The Consultant shall coordinate with the GC to ensure the results are communicated to the Subs and vendors who have training responsibilities.
- .3 In addition to these general requirements, the detailed training requirements of Owner personnel by Subs and vendors is detailed in specific commissioning specification sections (refer to Section 01 91 00 subsection 1.6 of this document for details).
- .4 The Contractor shall ensure that each Sub and vendor responsible for training will submit a written training plan to the Cx Team for review and approval prior to training. The plan will cover the following elements:
  - .1 Equipment (included in training)
  - .2 Intended audience

- .3 Location of training
  - .4 Objectives
  - .5 Subjects covered (description, duration of discussion, special methods, etc.)
  - .6 Duration of training on each subject
  - .7 Instructor for each subject
  - .8 Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
  - .9 Instructor and qualifications
- .5 For the primary HVAC equipment, the Controls Subcontractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
  - .6 The M&E Consultant shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall include a review of all systems using the simplified system schematics including chilled water systems, heating systems, air distribution system, control system strategies, electrical distribution, etc.
  - .7 The GC develops an overall training schedule with the Consultant with input from the Owner/PM and FM staff. The CxA shall oversee implementation of the training plan. The Owner and FM staff shall advise the Consultant and CxA if training was satisfactorily completed.

### **3.15 DEFERRED TESTING**

- .1 All necessary testing shall be completed for all required equipment/ systems. This includes, but is not limited to, projects that are occupied or operational before all equipment has been installed, or projects that reach substantial completion during peak heating or cooling months. Deferred and/or seasonal testing will be directed and documented by the CxA. The Contractor/ Subs shall be involved in any required deferred and/ or seasonal testing including aiding in the execution of tests and conducting required deficiency corrections. Testing shall be completed including deficiency resolution even if activities occur after the project is completed.
- .2 Unforeseen Deferred Tests: If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of test sheets and functional testing may be delayed upon approval of the Owner/PM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.
- .3 Seasonal Testing During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made.

### **3.16 WRITTEN WORK PRODUCTS**

- .1 The commissioning process generates a number of written work products described in various parts of the Specifications. The Commissioning Plan lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives

and approves them and the location of the specification to create them. In summary, the written products are:

<b>PRODUCT</b>		<b>DEVELOPED BY</b>
1	Final Commissioning Plan	CxA
2	Commissioning Meeting Minutes	CxA
3	Commissioning Schedule	GC with CxA
4	Equipment Documentation Submittals	Subs
5	Mock-Up Test Reports	Subs
6	Sequence Clarifications	Subs and Consultant (as needed)
7	Pre-functional Test Sheets	CxA
8	Filled out Pre-Functional Test Sheets	Subs
9	Start-up and Initial Checkout Plan	Subs and CxA
10	Start-up and Initial Checkout/ Reports	Subs
11	Final TAB Report	TAB Subcontractors
12	Commissioning Issues Log (deficiencies)	CxA
13	Functional Test Forms	CxA
14	Filled Out Functional Test Forms	CxA
15	Building Envelope Test Forms	Subs and CxA (reviews)
16	Filled Out Building Envelope Test Forms	Subs
17	O&M Manuals	Subs
18	Overall Training Plan	GC, Consultant and Owner/ PM
19	Specific Training Agendas	Subs
20	Final Commissioning Report and Record	CxA
21	Final LEED Cx Documentation	CxA

## APPENDIX A – COMMISSIONING ROLES AND RESPONSIBILITIES MATRIX

No.	ACTIVITIY	COMMISSIONING TEAM					
		Owner/ PM	Consultant	CxA	Contractor/ GC	Subs/ Vendors/ Suppliers	FM Staff
Commissioning Activities During Design							
1	Cx Review of Design Docs, Drawings and Specs	Review	Review	Provide			
2	Establish Cx Specs	Review	Review	Provide	Review	Review	
3	Include Cx Specs in Construction Documents		Provide				
4	Establish Cx Plan	Approve	Review	Provide	Assist	Assist	Review
Commissioning Activities During Construction & Performance Verification							
5	Contractor Shop Drawings	Review	Review	Review	Assist	Provide	
6	Develop Cx Schedule & Integrate with Master Schedule	Review		Assist	Provide	Assist	
7	Conduct Cx Meetings			Provide			
8	Maintain list of systems and their Cx status (CPM)	Review		Provide	Assist	Assist	
9	Maintain list of Cx issues, status, resolution (IOC Report)	Review	Review	Provide	Review	Assist	Review
10	Conduct Cx focused site visits			Provide	Assist	Assist	
11	Conduct Building Envelope Mock-ups, Submit Reports	Review	Review	Review	Assist	Provide	
12	Establish Start-Up Procedures for Systems			Review	Review	Provide	
13	Establish Equipment Specific Pre-Functional Test Sheets	Review	Review	Provide	Review	Assist	Review
14	Establish System Specific Functional Test Sheets (M, E, BAS)	Review	Review	Provide	Review	Assist	Review
15	Establish Building Envelope Checks and Tests	Review	Review	Review	Assist	Provide	
16	Perform Construction QC testing & inspections				Provide	Provide	
17	Verify readiness for startup & Cx checking				Assist	Provide	
18	Complete Start-ups and Cx Pre-functional test sheets	Review		Review		Provide	
19	Provide Controls Verification Report	Review	Review	Review		Provide	
20	Provide Balancing Report	Review	Approve	Review		Provide	
21	Schedule & Coordinate execution of Cx testing			Assist	Provide	Assist	
22	Operate & demonstrate system equipment during Cx					Provide	
23	Complete Cx Functional Test Sheet (M, E, BAS)	Review		Provide	Assist	Assist	

No.	ACTIVITY	COMMISSIONING TEAM					
		Owner/ PM	Consultant	CxA	Contractor/ GC	Subs/ Vendors/ Suppliers	FM Staff
24	Complete Building Envelope Testing	Review		Review	Provide	Provide	
25	Witness Functional Testing as appropriate	Provide		Provide	Provide	Provide	Provide
26	Resolve Issues Identified During Commissioning	Approve	Assist	Approve	Provide	Provide	
27	Establish O&M manual	Review	Approve	Review	Provide	Provide	Review
<b>Commissioning Activities During Training</b>							
28	Establish training curriculum; Schedule & Agenda	Approve		Review	Provide	Provide	Review
29	Deliver training program	Review		Review	Assist	Provide	
30	Participate as Trainee						Provide
31	Verify training has been delivered	Provide		Provide	Provide		Provide
32	Administer trainee attendance, records				Provide	Assist	
<b>Commissioning Activities During Post Occupancy</b>							
33	Provide Final Cx Record and Documentation	Approve		Provide	Review		
34	Establish schedule for post occupancy cx activities	Review		Provide	Assist		
35	Complete Seasonal/ Deferred Cx Testing (as required)	Review		Provide			
36	Witness Seasonal/ Deferred Cx Testing as appropriate	Review		Provide	Provide	Provide	Provide
37	Conduct a post-occupancy (10 month warranty) review	Assist		Provide			Assist
38	Complete LEED Cx Submission		Review	Provide			

Legend:		
Provide - Responsible for Delivery	Approve - Authorize Document	Blank - NA
Assist - Provide Support	Review - Review & Provide Comment	

END OF SECTION

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 APPLICABLE STANDARDS**

- .1 Applicable Standards are listed below:
  - .1 ASHRAE Standard 202-2024 - The Commissioning Process Requirements for New Buildings and New Systems
  - .2 ASHRAE Standard 230-2022 - Commissioning Process for Existing Buildings and Systems
  - .3 ASHRAE Guideline 0-2019 - the Commissioning Process
  - .4 ASHRAE Guideline 0.2-2015 - Commissioning Process for Existing Systems and Assemblies
  - .5 ASHRAE Guideline 1.1-2025 - Application of the Commissioning Process to New HVAC&R Systems
  - .6 ATSM E2813 – Standard Practice for Building Enclosure Commissioning
  - .7 ATSM E2947 – Standard Guide for Building Enclosure Commissioning
  - .8 ASTM E3158 - Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building
  - .9 CaGBC LEED v4.1 Building Design and Construction Reference Guide
    - .1 LEED EAp1: Fundamental Commissioning and Verification
    - .2 LEED EAc1: Option 1. Path 1: Enhanced Commissioning
  - .10 CSA Z320-11 Building Commissioning Standard & Check Sheets
  - .11 CSA C282-15 – Emergency Power Supply for Buildings
  - .12 NIBS Guideline 3-2012 – Building Enclosure Commissioning Process

### **1.3 GENERAL**

- .1 Building enclosure/ envelope commissioning is the process of ensuring that all building enclosure components perform collectively according to the building enclosure design intent and that the installation is adequately tested and that the specified performance is verified and documented. The purpose of this section is to specify building envelope commissioning responsibilities as required by Divisions 7 & 8.
- .2 Commissioning requires the participation of Subcontractors performing the work of Divisions 7 & 8 to ensure that exterior building envelope components and assemblies including system-to-system interfaces are tested in compliance with relevant standards and meet or exceed the performance requirements stipulated in the Contract Documents. The general commissioning requirements and coordination are detailed in Section 01 91 00. The Contractor shall ensure the Building Envelope Subcontractors are familiar with all applicable parts of Section 01 91 00 and the commissioning plan issued by the CxA. The Contractor shall ensure that the Contractor and all Building Envelope Subcontractors execute all commissioning responsibilities assigned to them

in the Contract Documents including and building envelope testing requirements in Divisions 7 & 8 including those of the specifications listed in Section 1.5 of this 01 91 19.

#### **1.4 SYSTEMS TO BE COMMISSIONED**

- .1 Systems to be commissioned as part of this contract include, but may not be limited to the following:
  - .1 Building Envelope

#### **1.5 COMMISSIONING TEAM**

- .1 The Commissioning Team shall consist of representatives of the following as appropriate:
  - .1 Owner and the Owner's FM Staff
  - .2 Consultant
  - .3 Commissioning Authority (CxA)
  - .4 General Contractor (GC)
  - .5 Subcontractors (Mechanical, Electrical, Controls, TAB, Building Envelope)
  - .6 Specialized third-party for verification

#### **PART 2 – PRODUCTS**

Not Used.

#### **PART 3 – EXECUTION**

##### **3.1 COMMISSIONING AUTHORITY RESPONSIBILITIES**

- .1 The Commissioning Authority shall:
  - .1 Plan, organize and implement the commissioning process as specified herein;
  - .2 Prepare the commissioning plan, ensure its distribution for review and comment;
  - .3 Revise the commissioning plan as required during construction;
  - .4 Chair commissioning meetings, and prepare and distribute minutes to all commissioning team members, whether or not they attended the meeting;
  - .5 In conjunction with the GC, coordinate commissioning activities;
  - .6 Assist GC/Subs, as required, in developing/reviewing the building envelope performance test procedures prior to execution;
  - .7 Monitor system verification checks, and ensure the results are documented as the checks are done;
  - .8 Direct the GC and applicable Subcontractor's to conduct building envelope commissioning testing on building enclosure elements/ assemblies as required to ensure that all required performance tests are carried out for verification purposes;
  - .9 Witness building envelope performance tests and track results;



- .10 Prepare and submit a commissioning report which documents all checks and tests done throughout the commissioning process, and the results obtained from each;
- .11 Ensure all required O&M manuals, instructions and demonstrations are provided to the Owner's designated facility operating staff.

### **3.2 CONSULTANT RESPONSIBILITIES**

- .1 The Consultant commissioning responsibilities are outlined below:
  - .1 Review the commissioning plan, proposed test procedures, and participate (as appropriate) in on-site commissioning meetings.
  - .2 At their discretion during the acceptance phase of the commissioning process, be on site to review commissioning documentation, to witness building envelope commissioning tests, and to analyze the installation and its performance

### **3.3 OWNER/ PROJECT MANAGER RESPONSIBILITIES**

- .1 The Owner shall have the following commissioning responsibilities
  - .1 Ensure the availability of facility operations staff for all scheduled instructions and demonstration sessions (training).
  - .2 At their discretion, witness commissioning performance tests.

### **3.4 SUBCONTRACTOR RESPONSIBILITIES**

- .1 All required testing per the specifications, unless other specified, shall be subcontracted by the GC (through various Building Envelope Subcontractors and Testing Agencies). Testing shall be conducted by an agency, fully accredited by the appropriate governing body for each of the components of systems to be tested or evaluated for compliance with the requirements of the Contract Documents.
- .2 The commissioning responsibilities applicable to the GC's Building Envelope Subcontractors are as follows:
  - .1 Documentation of all testing and inspection reports on building envelope shall be provided and forwarded to the CxA. Written documentation must contain recorded test values of all tests performed per the individual product specification.
  - .2 Provide schedule of field quality and control tests and inspections required by the Contract Documents to the CxA.
  - .3 Perform tests using qualified personnel. Provide jobsite and building envelope assembly/ component access. Provide necessary instruments and equipment to conduct testing including mock-ups and building envelope performance testing.
  - .4 Include the cost of commissioning in the contract price.
  - .5 In each purchase order or subcontract written, include requirements for submittal data.
  - .6 Attend a building envelope commissioning scoping meeting and other necessary meetings scheduled by the CxA to facilitate the Cx process.
  - .7 Contractors shall provide normal cut sheets and shop drawing submittals to the CxA of commissioned equipment. Provide additional requested documentation, to the CxA for

- development of mock-up test procedures and building envelope performance testing procedures.
- .1 Typically, this will include detailed manufacturer installation and initial checkout, full details of any owner-contracted tests, laboratory testing reports (if any), and full warranty information including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Authority.
  - .2 The Commissioning Authority may request further documentation necessary for the commissioning process. This data request may be made prior to normal submittals.
  - .8 Contractors shall assist (along with the Consultant) in clarifying the function or performance of commissioned equipment in areas where the specifications, or component documentation is not sufficient for writing detailed testing procedures.
  - .9 Prepare mock-up test procedures (if required) as specified in the Contract Documents/ Project Specifications. Subs shall ensure test procedures support feasibility, safety and envelope material/ component protection.
  - .10 Provide skilled technicians to execute any required mock-up testing following approved procedures. Tests may be witnessed by the Owner or other parties as appropriate. Submit completed mock-up tests reports to the CxA, PM, GC.
  - .11 Develop an initial checkout plan using manufacturer's. Submit manufacturer's detailed procedures and other requested equipment documentation to CxA for review.
  - .12 Prepare the specific building envelope performance test procedures specified in the Contract Documents and as required by Divisions 7 & 8. Subs shall ensure test procedures to ensure feasibility, safety and envelope material/ component protection. Submit to the CxA for review prior to execution.
  - .13 Provide skilled technicians to execute starting of equipment and to execute the building envelope performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving where performance does not meet the design requirements and contract documents.
  - .14 Perform building envelope performance testing, using approved test forms, under the direction/ witnessing of the CxA as specified in this section (Section 01 91 19, reference section 3.8) and as required by the Contract Documents and divisions 7 & 8 (as applicable). Assist the CxA in interpreting the monitoring data, as necessary.
  - .15 Correct deficiencies (differences between specified and observed performance) as interpreted by the CxA, Owner/ PM, GC and Consultant and retest the equipment.
  - .16 Cost associated with re-testing caused by failure of the exterior building envelope tests during mock-ups or construction phase performance testing shall be the responsibility of the GC and applicable Subcontractor's. These costs also include fees and reimbursable expenses for the Owner's consultant and CxA to witness the re-tests.
  - .17 During construction, maintain as-built red-line drawings for all drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line as-built drawings for all drawings.

- .18 Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
- .19 Provide any operational and maintenance data for the building enclosure systems, subsystems and components to the CxA.
- .20 Execute deferred performance testing, if required, witnessed by the CxA, according to the specifications.
- .21 Correct deficiencies and make necessary adjustments to as-built drawings for applicable issues identified in any deferred testing.

### **3.5 SUBMITTALS**

- .1 Section 7 & 8 Contractors shall provide submittal documentation relative to building envelope commissioning to the CxA as requested by the CxA.
  - .1 Qualifications Data: For fabricators, installers, and testing agencies, submit to the Commissioning Agent for review all qualifications required in Divisions 7 & 8 for review.
  - .2 Preconstruction Mock-Up Test Reports: all preconstruction air and water leakage performance test results, including all failed tests, recording the noted deficiency and the required repair, and provide a copy of all remediation processes and QC/QA processes that will be put in place to address the deficiency on future work product
  - .3 Source Quality Control Reports: retain a copy for field review by the Commissioning Agent and include in the closeout submittal a copy of all manufacturer QA/QC reports submitted for products supplied for the project
  - .4 Field Quality Control Reports: provide a copy of the test reports for all field water and air penetration and other appropriate building exterior enclosure tests completed

### **3.6 MOCK-UP TESTS**

- .1 The appropriate GC's Subcontractors shall follow the mock-up and initial checkout procedures listed in the Responsibilities list in this section 3.4 and this section 3.6. Mock-ups shall follow Contract Documents/ specifications. The GC or applicable Subcontractor(s) are required to complete component/ mock-ups for various assemblies to ensure building envelope components are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and building envelope testing do not relieve or lessen this responsibility or shift that responsibility partially to the Commissioning Authority or Owner.
- .2 Coordinate installation of exterior envelope and materials for which mock-up are required in individual specifications, along with supporting material. Coordinate construction of full-size mock-ups according to approved shop drawings. Mock-up of the exterior envelope shall be erected separately from the building but on project site, consisting of multiple products, assemblies, and sub-assemblies as required.
- .3 Parts of the work not conforming to acceptable mock-ups and quality control shall be rejected. All deficiencies shall be resolved prior to full scale construction of the exterior building envelope structure.

### 3.7 BUILDING ENVELOPE FIELD PERFORMANCE TESTING

- .1 The appropriate Subcontractors shall follow the building envelope performance testing procedures listed in the Responsibilities list in this Section 01 91 00, Part 3.11, this section 3.7 as applicable. Building envelope testing shall be in accordance with the requirements of Divisions 7 & 8. Subcontractors applicable to building envelope work have the responsibility and is required to complete all required building envelope testing to ensure compliance with the design performance requirements and the Contract Documents.
- .2 Building envelope performance testing is intended to begin upon completion of an assembly or enclosure system. Building envelope testing may proceed prior to completion of the entire building enclosure system at the discretion of the CxA, Consultant, Owner/PM and GC. Beginning testing before full completion, does not relieve the Subcontractor from fully completing the system, including all Pre Functional test sheets as soon as possible.
- .3 The GC shall coordinate testing with the required Subcontractor or Testing Agency, and inform the Cx Team including the CxA minimum 5 days in advance of testing.
- .4 The GC shall ensure that equipment or tools required to execute any building envelope testing are provided by the party executing the test.
- .5 The GC shall ensure its Subcontractors/ Testing Agencies perform all required envelope testing. Test results shall be submitted to the Cx Team and CxA for review.
- .6 Building Envelope Performance Testing shall include the following testing to be performed by the GC's Building Envelope Subcontractors/ Testing Agencies.

BUILDING ENVELOPE FIELD PERFORMANCE TESTS		
Test/ Property	Standard	Title
Air Leakage	ASTM E1186	Standard Practice for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
Air Leakage	ASTM E783	Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors ("Chamber Test")
Water Penetration	ASTM E1105	Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference ("Chamber Test")
Water Penetration	AAMA 501.2	Calibrated Nozzle Testing: Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Differential. (For curtain wall, wall penetrations, and roof/roof penetrations)
Thermal Performance (Wall Assemblies)	ASTM C1060	Standard Practice for Thermographic Inspection of Insulation Installations in Enveloped Cavities of Frame Buildings
Thermal Performance (Roof Assemblies)	ASTM C1153	Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging

<b>BUILDING ENVELOPE FIELD PERFORMANCE TESTS</b>		
<b>Test/ Property</b>	<b>Standard</b>	<b>Title</b>
Adhesion Testing	ASTM C1521	Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
Air Tightness Testing	ASTM E3158	Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building

### **3.8 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS**

- .1 Refer to Specification 01 91 00 Part 3.12 for more information in addition to this 01 91 19.

### **3.9 TRAINING OF OWNER PERSONNEL**

- .1 Refer to Specification 01 91 00 Part 3.14 for requirements for training, as required/ applicable to building envelope components/ assemblies

### **3.10 DEFERRED TESTING**

- .1 Refer to Section 01 91 00, Part 3.15 for requirements of deferred testing.

### **3.11 WRITTEN WORK PRODUCTS**

- .1 Written work products for building envelope commissioning will consist of the mock-up test reports, and building envelope test sheets. Refer to Section 01 91 00 Part 3.16.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including Sections of Division 01.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Related *Work*
- .4 1.4 References
- .5 1.5 Samples
- .6 2.1 Materials
- .7 2.2 Source Quality Control
- .8 3.1 Installation
- .9 3.2 Maintenance

### **1.3 RELATED WORK**

- .1 Section 31 05 17 - Aggregates
- .2 Section 31 23 13 – Site Grading

### **1.4 REFERENCES**

- .1 ASTM D4791-89, Test Method for Flat or Elongated Particles in Coarse Aggregate.
- .2 OPSS 1001.

### **1.5 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Allow continual sampling by the *Consultant* during production.
- .3 *Provide* the *Consultant* with access to source and processed material for sampling.
- .4 Install sampling facilities at discharge end of production conveyor to allow the *Consultant* to obtain representative samples of items being produced. Stop conveyor belt when requested by the *Consultant* to permit full cross section sampling.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Clear stone for mud mat and along bottom of silt control fencing: 50 mm clear stone in accordance with OPSS 1001.

- .3 Geotextile for siltation control fence shall be Class I non-woven geotextile fabric in accordance with OPSS 1860.

## **2.2 SOURCE QUALITY CONTROL**

- .1 Inform the *Consultant* of proposed source of aggregates and *Provide* access for sampling at least four weeks prior to commencing production.
- .2 If, in the opinion of the *Consultant*, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise the *Consultant* four weeks in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection by the *Consultant* if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- .1 Mud Mat Installation
  - .1 Place clear stone to the dimensions indicated on the *Contract Drawings* to a depth of 300 mm.
  - .2 Remove and replace top layers of clear stone when they become laden with mud and the mud mat becomes ineffective in removing mud from equipment exiting the *Site*.
  - .3 The mud mat installation does not alleviate the *Contractor's* responsibility to clean mud from adjacent roadways as a result of the construction.
- .2 Silt Control Fence
  - .1 Install silt control fence along construction *Site* perimeter including tee bars, geotextile filter fabric, clear stone along the upstream side of the fence in the instance the ground is frozen.

### **3.2 MAINTENANCE**

- .1 Maintain the mud mat and replace clear stone during the construction period as required to maintain the function of the mud mat.
- .2 Maintain silt control fencing for the duration of the construction and replace as required until the *Site* is stabilized as determined by the *Consultant*.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Related *Work*
- .4 1.4 References
- .5 2.1 Materials
- .6 3.1 Grade Preparation & Sub-Base Course
- .7 3.2 Granular Base
- .8 3.3 Concrete
- .9 3.4 Tolerances
- .10 3.5 Expansion and Contraction Joints
- .11 3.6 Curing
- .12 3.7 Linseed Oil Treatment
- .13 3.8 Backfill
- .14 3.9 Defective Concrete
- .15 3.10 Field Quality Control

### **1.3 RELATED WORK**

- .1 Section 31 23 10 - Excavating, Trenching and Backfilling
- .2 Section 32 11 23 - Granular Base
- .3 Section 32 11 19 - Granular Sub-Base
- .4 Section 32 12 16 - Asphalt Paving

### **1.4 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.2-M89, Boiled Linseed Oil
  - .2 CAN/CGSB-3.3-M89, Kerosene
- .3 American Society for Testing and Materials (ASTM).
  - .1 ASTM D698-91, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>)
- .4 Ontario Provincial Standard Specification (OPSS) 353.



- .5 Concrete Toe Wall OPSD Detail 3120.100

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Concrete mixes and material shall conform to OPSS 1301, 1302, 1303, 1305, 1306, 1308, 1315, and 1350. Concrete for curb and toe wall construction shall have a minimum compressive strength of 30 MPa after 28 *Days*.
- .2 Granular Base and Sub-Base: in accordance to Section 32 11 23 and 32 11 19, respectively.
- .3 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to *Provide* water soluble soap.
- .4 Fill material: in accordance to Section 31 23 10 – Excavating, Trenching, Backfilling.
- .5 Boiled linseed oil: in accordance to CAN/CGSB-1.2.
- .6 Kerosene: in accordance to CAN/CGSB-3.3.

## **PART 3 - EXECUTION**

### **3.1 GRADE PREPARATION & SUB-BASE COURSE**

- .1 Grading: in accordance to Section 31 23 13 – Site Grading.
- .2 Place sub-base course of OPSS Granular 'B', Type I in maximum 150 mm loose lifts and compact to a minimum of 100% of SPMDD.

### **3.2 GRANULAR BASE**

- .1 Obtain the *Consultant's* approval of subbase before placing granular base.
- .2 Place compacted OPSS Granular 'A' to depth, lines and widths as indicated.
- .3 Compact granular base to a minimum of 100% of SPMDD.

### **3.3 CONCRETE**

- .1 Obtain the *Consultant's* approval of granular base.
- .2 Do concrete curb construction in accordance with OPSS 353.
- .3 *Provide* 1.0m. wide depressions in curb where specified on the *Drawings* as required to allow surface drainage to be conveyed to adjacent bio-swale areas.

### **3.4 TOLERANCES**

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

### **3.5 EXPANSION AND CONTRACTION JOINTS**

- .1 Joints are to be constructed in accordance with OPSS 353.07.06.

### **3.6 CURING**

- .1 Cure concrete by adding moisture continuously in accordance with CAN/CSA-A23.1 to exposed finished surfaces for at least one *Day* after placing, or by sealing moisture in by curing compound approved by the *Consultant*.

- .2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film. In accordance with manufacturer's requirements.
- .4 Concrete curing is to be in accordance with OPSS 904.

### 3.7 LINSEED OIL TREATMENT

- .1 After concrete has cured for specified curing time and when surface of concrete is dry, apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks, and gutters.

### 3.8 BACKFILL

- .1 Allow concrete to cure for seven *Days* prior to backfilling.
- .2 Backfill to designated elevations with material approved by the *Consultant*. Compact and shape to required contours as indicated by the *Consultant*.

### 3.9 DEFECTIVE CONCRETE

- .1 Concrete is defective when:
  - .1 Containing excessive honeycombing or embedded debris.
  - .2 Concrete damaged by freezing or which is unsatisfactory due to placement at too high a temperature.
  - .3 Average 28-Day strength of any three consecutive strength tests is less than specified minimum 28-Day strength.
  - .4 Any 28-Day strength test result is more than 3.5 MPa below the specified minimum 28-Day strength.
- .2 Repair of defective concrete work:
  - .1 Repair defective areas while concrete is still plastic, otherwise wait until curing is completed. Use repair methods approved by the *Consultant*.
  - .2 Grind off high surface variations where required by the *Consultant*.
- .3 Remove and replace defective concrete where required by the *Consultant*:
  - .1 Remove between joints by sawing through concrete across full width.
  - .2 Replace with new concrete to this Section as required by the *Consultant*.
  - .3 Construct contraction joint between sawn face of existing concrete and face of new concrete.
  - .4 Install tie bars between old and new concrete as required by the *Consultant*.

### 3.10 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by the *Consultant* in accordance with CAN/CSA-A23.1.
- .2 The *Consultant* may take additional test cylinders during cold weather concreting. Cure cylinders on *Site* under same conditions as concrete which they represent.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General requirements
- .2 1.2 Section Includes
- .3 1.3 Description
- .4 1.4 Reference Standards
- .5 1.5 Approved Products
- .6 1.6 Delivery, Material Handling and Storage
- .7 1.7 Engineering Design and Certification
- .8 1.8 Submittals
- .9 2.1 Definitions
- .10 2.2 Products
- .11 3.1 Design Standard
- .12 3.2 Soil
- .13 3.3 Design Geometry
- .14 3.4 State of Stress
- .15 3.5 Inclination of Failure Surface
- .16 3.6 Settlement Control
- .17 3.7 Global Stability
- .18 3.8 Inspection
- .19 3.9 Construction Tolerances
- .20 3.10 Site Preparation
- .21 3.11 Installing Drainage System
- .22 3.12 Leveling Base or Spread Footing Placement
- .23 3.13 Installation of Modular Concrete Retaining Wall Units
- .24 3.14 Drainage Soil
- .25 3.15 Retained Soil
- .26 3.16 Finishing Wall

### **1.3 DESCRIPTION**

- .1 The work covered by this section includes the furnishing of all labor, materials, equipment and incidentals for the design, inspection and construction of a modular concrete retaining wall including the drainage system as shown on the Construction Drawings and as described by the *Contract Specifications*. The work included in this section consists of, but is not limited, to the following:
  - .1 Design, inspection and certification by a registered professional engineer.

- .2 Excavation and foundation soil preparation.
- .3 Furnishing and placement of the leveling base.
- .4 Furnishing and placement of the drainage system.
- .5 Furnishing and placement of geotextiles.
- .6 Furnishing and placement of segmental retaining wall facing units.
- .7 Furnishing and compaction of drainage and retained soils.

#### **1.4 REFERENCE STANDARDS**

- .1 Engineering Design
  - .1 NCMA Design Manual for Segmental Retaining Walls, Second Edition.
  - .2 NCMA TEK 2-4 - *Specifications* for Segmental Retaining Wall Units.
  - .3 NCMA SRWU-2 - Determination of Shear Strength between Segmental Concrete Units.
- .2 Segmental Retaining Wall Units
  - .1 ASTM C 140 - Sampling and Testing Concrete Masonry Units
  - .2 ASTM C 1262 - Evaluating the Freeze - Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units.
  - .3 ASTM C 33 - Specification for Concrete Aggregates
  - .4 ASTM C 90 - Standard Specification for Load-Bearing Concrete Masonry Units
  - .5 ASTM C 150- Specification for Portland Cement
  - .6 ASTM C 595 - Specification for Blended Hydraulic Cements.
- .3 Geotextile Filter
  - .1 ASTM D 4751 - Standard Test Method for Apparent Opening Size
- .4 Soils
  - .1 ASTM D 698 - Moisture Density Relationship for Soils, Standard Method
  - .2 ASTM D 422 - Gradation of Soils
  - .3 ASTM D 424 - Atterberg Limits of Soils
  - .4 ASTM D G51 - Soil pH
- .5 Drainage Pipe
  - .1 ASTM D 3034 - Specification for Polyvinyl Chloride (PVC) Plastic Pipe
  - .2 ASTM D 1248 - Specification for Corrugated Plastic Pipe

#### **1.5 APPROVED PRODUCTS**

- .1 Siena Stone® 925mm Unit Segmental Retaining Wall System as supplied by Unilock

- .2 Color: Natural.
- .3 Or equivalent

## 1.6 DELIVERY, MATERIAL HANDLING AND STORAGE

- .1 The installing contractor shall check all materials delivered to the site to ensure that the correct materials have been received and are in good condition.
- .2 The *Contractor* shall store and handle all materials in accordance with Unilock's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, breaking, chipping or other causes.

## 1.7 ENGINEERING DESIGN AND CERTIFICATION

- .1 The term Engineer shall refer to the individuals or firms who have been retained by the *Contractor* to *Provide* design and inspection services for the retaining wall. The Design Engineer may be a different individual or firm from the Inspecting Engineer as Unilock may *Provide* this service. The Engineer(s) must be qualified in the area of segmental retaining wall design and construction and must be licensed to practice engineering in the Province that the wall is to be constructed.
- .2 The Engineer(s) will perform the following tasks:
  - .1 Produce sealed construction drawings and detailed design calculations, completed in accordance with the design requirements outlined in Part 3 of these specifications.
  - .2 Review the site soil and geometric conditions to ensure the designed wall is compatible with the site prior to construction.
  - .3 Inspect the site conditions, materials incorporated into the retaining wall, and the construction practices used during the construction.
  - .4 *Provide* the *Contractor* with a letter after completion, certifying the design meets the requirements of this specification, the design was compatible with the site and the wall was constructed according to design.

## 1.8 SUBMITTALS

- .1 The *Contractor* shall submit the following information for approval thirty (30) days prior to the construction of the segmental retaining wall.
  - .1 Design Submittal – *Provide* sets of stamped construction drawings and detailed design calculations, completed and sealed by the Engineer in accordance with the design requirements outlined in Part 3 of this specification.
  - .2 Materials Submittal – Manufacturer's certifications, stating that the SRW units and imported aggregates and soils meet the requirements of this specification and the Engineer's design.
  - .3 Installer Qualifications - The *Contractor* must be able to demonstrate that their field construction supervisor has the necessary experience for the project by providing documentation showing that they have successfully completed projects of similar scope and size.

## PART 2 PRODUCTS

### 2.1 DEFINITIONS

- .1 Modular concrete retaining wall units are dry-cast solid concrete units that form the external fascia of a modular unit retaining wall system.

- .2 Coping units are the last course of concrete units used to finish the top of the wall.
- .3 Retained soil is an in-situ soil or a specified soil that is placed behind the wall drainage material.
- .4 Foundation soil is the in-situ soil beneath the wall structure.
- .5 Drainage aggregate is a free draining soil with natural soil filtering capabilities, or a free draining soil encapsulated in a suitable geotextile, or a combination of free draining soil and perforated pipe all wrapped in a geotextile, placed directly behind the modular concrete units.
- .6 Drainage pipe is a perforated polyethylene pipe used to carry water, collected at the base of the retaining wall, to outlets in order to prevent pore water pressures from building up behind the wall facing modules.
- .7 Non-woven geotextiles are permeable synthetic fabrics formed from a random arrangement of fibers in a planar structure. They allow the passage of water from one soil medium to another while preventing the migration of fine particles that might clog a drainage medium.
- .8 All values stated in metric units shall be considered as accurate. Values in parenthesis stated in imperial units are the nominal equivalents.

## 2.2 PRODUCTS

- .1 Concrete Segmental Retaining Wall Units
  - .1 The concrete wall modules shall be 185 x 1000 x 925 (7.25 x 39 x 36) (925mm Unit) with a maximum tolerance of plus or minus 3 mm (1/8 in.) for each dimension.
  - .2 The retaining wall modules shall be solid units and have a minimum weight of 450kg (1102 lbs.) and 366kg (895 lbs.) per unit.
  - .3 The concrete wall modules shall have an integral shear key connection that shall be offset to permit a minimum wall batter of 1H: 8V.
  - .4 The concrete wall modules shall have a minimum 28-day compressive strength of 35 MPa (5000 psi) as tested in accordance with ASTM C 140. The concrete shall have a maximum moisture absorption rate of 5 percent to ensure adequate freeze-thaw protection.
- .2 Retained Soil
  - .1 The retained soil shall be on site soils unless specified otherwise in the *Construction Specifications* or as directed by the *Owner* or *Owner's Representative*. If imported fill is required, it shall be examined and approved by the Engineer.
- .3 Foundation Soil
  - .1 The foundation soil shall be the native undisturbed on site soils. The foundation soil shall be examined and approval by the Engineer prior to the placement of the base material.
- .4 Leveling Base Material
  - .1 The footing material shall be non-frost susceptible, well graded compacted crushed stone (GW-Unified Soil Classification System), or a concrete leveling base, or as shown on the Construction Drawings.
- .5 Drainage Soil

- .6 The drainage soil shall be a free draining angular granular material of uniform particle size smaller than 25 mm (1 in.) separated from the retained soil by a geotextile filter. The drainage soil shall be installed directly behind the SRW units.
- .7 Drainage Pipe
  - .1 The drainage pipe shall be perforated corrugated HDPE or PVC pipe, with a minimum diameter of 100 mm (4 inches), protected by a geotextile filter to prevent the migration of soil particles into the pipe, or as specified on the construction drawings.
- .8 Geotextile Filter
  - .1 The non-woven geotextile shall be installed as specified on the construction drawings. Although selection of the appropriate geotextile specifications is site soil specific, a commonly used geotextile for filtration will have an Apparent Opening Size ranging between 0.149 and 0.210 mm (U.S. Sieve Sizes 100 to 70) and a minimum unit weight of 135 grams per square meter (4.0 oz /square yard). The coefficient of permeability will typically range between 0.1 and 0.3 cm/second.

### **PART 3 EXECUTION**

#### **3.1 DESIGN STANDARD**

- .1 The Design Engineer is responsible for providing a design that shall consider the external stability, internal stability, and local stability of the SRW System. It is the responsibility of the Certifying Engineer or *Site* Geotechnical Engineer to determine if further design considerations must be implemented to ensure adequate global/overall slope stability, and/or, if the foundation soils will require special treatment to control total and differential settlement. The design life of the structure shall be 75 years unless otherwise specified in the construction drawings.
- .2 The segmental retaining wall shall be designed in accordance with recommendations of the NCMA Design Manual for Segmental Retaining Walls, Second Edition. The following is a summary of the minimum factors of safety for the various modes of failure evaluated in the proposed design.

##### **External Stability**

Base Sliding	1.5
Overtopping	1.5
Bearing Capacity	2.0
Global Stability	1.3

##### **Internal Stability**

Shear Capacity	1.5
----------------	-----

#### **3.2 SOIL**

- .1 Design parameters: To be specified by the Engineer.

#### **3.3 DESIGN GEOMETRY**

- .1 The length, height, and overall elevations of the retaining wall must comply with the requirements of the proposed elevation detail, station information and site grading plan.
- .2 The structures' design height, H, shall be measured from the top of the leveling pad to the top of the wall where ground surface intercepts the wall facing.

- .3 Slopes above and below all sections of the segmental retaining wall are detailed in the site grading plan.
- .4 The minimum wall embedment shall be the greater of:
  - .1 The height of a SRW unit,
  - .2 150 mm (0.5 ft) or,
  - .3 The minimum embedment required because of the slope below the wall:

Slope Below Wall	Minimum Embedment
Level	H/10
3 : 1 (18.4 deg)	H/10
2 : 1 (26.5 deg)	H/7

- .5 The following surcharges shall be applied to the top of each design cross section based on the following proposed uses above the wall.

Use Above Wall	Minimum Surcharge
No Traffic	0 kPa (0 lb/sq. ft)
Light Traffic	4.8 kPa (100 lb/sq. ft)
Heavy Traffic	12.0 kPa (250 lb/sq. ft)

### 3.4 STATE OF STRESS

- .1 The lateral earth pressure to be resisted by the self weight of the retaining wall shall be calculated using the Coulomb coefficient of earth pressure,  $K_a$ , times the vertical stress at the base of the wall. The coefficient of active earth pressure,  $K_a$ , shall be used from the top to the bottom of the wall. The coefficient of active earth pressure,  $K_a$ , shall be assumed independent of all external loads except sloping fills. For sloping fills, the coefficient of active earth pressure,  $K_a$ , appropriate for the sloping condition, using Coulomb earth pressure shall be used in the analysis.

### 3.5 INCLINATION OF FAILURE SURFACE

- .1 A Coulomb failure surface passing through the base of the wall behind the facing units up to the ground surface at or above the top of wall shall be assumed in design of walls.

### 3.6 SETTLEMENT CONTROL

- .1 It is the responsibility of the Certifying Engineer or *Site* Geotechnical Engineer to determine if the foundation soils will require special treatment to control total and differential settlement.

### 3.7 GLOBAL STABILITY

- .1 It is the responsibility of the Geotechnical Engineer to determine if further design considerations must be implemented to ensure adequate global/overall slope stability.

### 3.8 INSPECTION

- .1 The Engineer is responsible for verifying that the contractor meets all the requirements of the specification. This includes the use of approved materials and their proper installation.
- .2 The *Contractor's* field construction supervisor shall have demonstrated experience and be qualified to direct all work related to the retaining wall construction.



### 3.9 CONSTRUCTION TOLERANCES

- .1 The following tolerances are the maximum allowable deviation from the planned construction,

Vertical Control: +/- 1.25 inches over a 10 ft distance, +/- 3 inches total  
Horizontal Control: +/- 1.25 inches over a 10 ft distance, +/- 3 inches total  
Rotation: +/- 2 degrees from planned wall batter  
Bulging: 1.0 inch over a 10 ft distance

### 3.10 SITE PREPARATION

- .1 The foundation soil shall be excavated or filled as required to the grades and dimensions shown on the Construction Drawings or as directed by the *Owner* or *Owner's Representative*.
- .2 The foundation soil shall be proof rolled and examined by the Engineer to ensure that it meets the minimum strength requirements according to the design assumptions. If unacceptable foundation soil is encountered, the contractor shall excavate the affected areas and replace with suitable quality material under the direction of the Engineer.
- .3 In cut situations, the native soil shall be excavated to the lines and grades shown on the Construction Drawings and removed from the site or stockpiled for reuse as retained soil.

### 3.11 INSTALLING DRAINAGE SYSTEM

- .1 The approved non-woven geotextile shall be set against the back of the first retaining wall unit, over the prepared foundation, and extend towards the back of the excavation, up the excavation face and back over the top of the drainage material to the retaining wall, or as shown in the Construction Drawings.
- .2 The drainage pipe shall be placed behind the leveling base, or lower course of facing units as shown in the Construction Drawings or as directed by the Engineer. The pipe shall be laid at a minimum gradient of 2% to ensure adequate drainage to free outlets.
- .3 T - Sections and outlet pipes shall be installed on the drainage pipe at 15 m (50 ft.) centers or as shown on the Construction Drawings.
- .4 The remaining length of geotextile shall be pulled taut and pinned over the face of the retained soil. Geotextile overlaps shall be a minimum of 300 mm (1 ft.) and shall be shingled down the face of the excavation in order to prevent the infiltration of retained soil into the drainage layer.

### 3.12 LEVELING BASE OR SPREAD FOOTING PLACEMENT

- .1 The leveling base material shall be crushed stone compacted to 98% Standard Proctor Density, or vibrated concrete along the grades and dimensions shown on the Construction Drawings or as directed by the Engineer. The minimum thickness of the leveling base shall be 185 mm (7.25 inches)

### 3.13 INSTALLATION OF MODULAR CONCRETE RETAINING WALL UNITS

- .1 The bottom row of retaining wall modules shall be placed on the prepared leveling base as shown on the Construction Drawings. Care shall be taken to ensure that the wall modules are aligned properly, leveled from side to side and front to back and are in complete contact with the base material.
- .2 The wall modules above the bottom course shall be placed such that the tongue and groove arrangement provides the design batter (i.e. setback) of the wall face. Successive courses shall

be placed to create a running bond pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it.

- .3 The wall modules shall be swept clean before placing additional levels to ensure that no dirt, concrete or other foreign materials become lodged between successive lifts of the wall modules.
- .4 A maximum of 3 courses of wall units can be placed above the level of the drainage material at any time.
- .5 The contractor shall check the level of wall modules with each lift to ensure that no gaps are formed between successive lifts.
- .6 Care shall be taken to ensure that the wall are not broken or damaged during handling and placement.

### **3.14 DRAINAGE SOIL**

- .1 The drainage soil will be placed behind the retaining wall modules with a minimum width of 300mm (1 ft.) and separated from other soils using the approved non-woven geotextile.
- .2 Drainage soil shall be placed behind the wall facing in maximum lifts of 6 inches and compacted to a minimum density of 95% Standard Proctor.
- .3 No heavy compaction equipment shall be allowed within 1 meter (3 ft.) of the back of the wall fascia.

### **3.15 RETAINED SOIL**

- .1 Retained soils shall be placed and compacted behind the drainage material in maximum lift thickness of 150 mm (6 inches). The retained soils shall be undisturbed native material or engineered fill compacted to a minimum density of 95% Standard Proctor.
- .2 No heavy compaction equipment shall be allowed within 1 m (3 ft.) of the back of the wall modules.

### **3.16 FINISHING WALL**

- .1 Items 3.12 to 3.15 shall be repeated until the grades indicated on the Construction Drawings are achieved.
- .2 Coping units shall be secured to the top of the wall with two 10mm (3/8 inch) beads of the approved flexible concrete adhesive positioned 50mm (2 inches) in front and behind the tongue of the last course of retaining wall units.
- .3 Finish grading above the wall to direct surface run off water away from the segmental retaining wall. Use a soil with a low permeability to restrict the rate of water infiltration into the retaining wall structure.

**END OF SECTION**

## PART 1 – GENERAL

### 1.1 General Requirements

- .1 Also included in this section are clauses for the following items:
  - Concrete Forming and Accessories
  - Concrete Reinforcing
  - Defective Concrete
  - Finishing of Formed Surfaces
  - Finishing Treatment of Slab Surfaces (Screeding and Trowelling)
  - Sealing and Curing
  - Slabs-on-Grade
  - Vapour Retarder Membrane for Slabs-on-Grade
- .2 Make a thorough examination of the drawings, site, specification and geotechnical report, to determine the intent, extent, materials and conditions of interfacing with other work and to be fully cognizant of the requirements.
- .3 Assume full responsibility for the design, for the adequacy and for the safety of all formwork and falsework.
- .4 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

### 1.2 Reference Standards

- .1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.
- .2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code.
- .3 Conform to the following CSA Standards:
  - .1 A23.1..... Concrete Materials and Methods of Concrete Construction.
  - .2 A23.2..... Test Methods and Standard Practices for Concrete.
  - .3 A23.3..... Design of Concrete Structures.
  - .4 A3000..... Cementitious Materials Compendium.
  - .5 G30.18 ..... Carbon Steel Bars for Concrete Reinforcement.

- .6 S269.1..... Falsework and Formwork.
- .7 W186..... Welding of Reinforcing Bars in Concrete Construction.
- .4 Conform to the following ASTM Standards:
  - .1 C94/C94M..... Standard Specification for Ready-Mixed Concrete.
  - .2 C309 ..... Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
  - .3 C661 ..... Standard Test Method for Indention Hardness of Elastomeric-Type Sealants by Means of a Durometer.
  - .4 C1116/C1116M ..... Standard Specification for Fiber Reinforced Concrete.
  - .5 D1751 ..... Standard Specification for Preformed Expansion Joint Filler for Concrete paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - .6 E1643..... Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
  - .7 E1745..... Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- .5 Conform to:
  - .1 ACI 214R..... Guide to Evaluation of Strength Test Results of Concrete.
  - .2 ACI 303R..... Guide to Cast-in-Place Architectural Concrete Practice.
- .6 Conform to SP-66, ACI Detailing Manual and the RSIC Reinforcing Steel Manual of Standard Practice.

- .7 In the event of conflict between reference standards, codes, drawings and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally the more stringent provision shall govern. No extras to the contract will be approved due to such clarification.
- .8 Conform to the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, last amendment.

### **1.3 Shop Drawings**

- .1 Provide shop drawings (placing drawings and bar lists) showing dimensions and complete information necessary for fabrication and placing reinforcing steel and accessories.
- .2 Submit shop drawings in accordance with directions.
- .3 Allow ten (10) working days for the review of shop drawings and supply as many copies for review and distribution as directed. Shop drawings shall be checked in detail by the General Contractor before submission. Drawings which fail to meet this requirement shall be returned marked NOT REVIEWED.
- .4 Review of the Shop Drawings is for general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for confirming, correlating all quantities and dimensions, and is not relieved of the responsibility for compliance with the intent of the drawings and specifications.
- .5 Only shop drawings bearing the review stamps, signed and dated shall be kept at site.

### **1.4 Source Quality Assurance**

- .1 Concrete supplied to this project shall meet the "Performance Based Specification" for concrete supply as adopted by the Ready Mix Concrete Association of Ontario.

- .2 **SUBMITTALS**

Brand names, and when requested, manufacturer's data sheets, detail drawings or diagrams of all items which are proposed for use in the concrete mix, or which are to be cast in or attached to the concrete structure or will affect the concrete structure in any way, are to be submitted for review.

These shall include but not be limited to:

- .1 A schedule of "Standardized mix designs" which indicates compliance with the Construction Documents. Schedule to include but not be limited to:

- .1 Concrete mix for each exposure class and strength to be utilized in the project.
- .2 Water/cementitious materials ratio (w/cm).
- .3 Air entrainment %, if applicable.
- .4 Include "Pump Mixes" if proposed for use.
- .5 Brand name and dosage of synthetic fibres.
- .6 Brand names of all admixtures to be incorporated into the mixes.
- .2 Brand names and, if requested, manufacturers' data sheet of proposed curing compound.
- .3 If requested, provide a certified copy of a mill test report of the reinforcing supplied, and samples of reinforcing bars to be used on this project for testing by the appointed Inspection and Testing Company before delivery to the site.
- .4 If requested, for unidentified reinforcing steel or reinforcing steel from non- Canadian mills, submit test data from an approved testing company verifying that each size and grade of reinforcing steel meets the Specification requirements. Pay for cost of such testing.
- .5 Shop drawings of elevators, showing complete details of proposed connections to the structure, including pockets, inserts and loadings.
- .6 Shop drawings of exterior walls panels showing complete details of proposed connections to the structure, including pockets, inserts and loadings.
- .7 Shop drawings of steel and precast concrete stairs showing complete details of connections to the structure including pockets, inserts and loadings. Shop drawings to be stamped by a Licensed Professional Engineer.
- .8 Cement finishing of floors shall be by a specialist sub-contractor thoroughly experienced in this type of work and a member in good standing with the Concrete Floor Contractors Association of Ontario (CFCAO). Submit references when requested.
- .3 MATCH SAMPLE OF ARCHITECTURAL QUALITY CONCRETE.
  - .1 Provide a sample of "Architectural Concrete" including reveals, to the Architect's approval. Repeat at no cost to the owner until approval has been given.

- .2 All "Architectural Quality" concrete throughout the project shall match or exceed the quality level of the approved "Match" sample as to surface, cone tie pattern and other features as directed.
- .3 Refer also to **Architectural Quality Concrete** later in this section.
- .4 Pre-Construction meetings as specified in this section.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

#### **.1 FORMWORK**

- .1 Formwork lumber: Plywood and wood formwork materials are to conform to CSA A23.1.
- .2 Plywood: Form plywood shall be exterior grade. Plywood shall be resin coated one side (in contact with concrete). Use sound undamaged plywood with clean true edges. Make-up or patching strips between panels shall be kept to a minimum.
- .3 Falsework Materials: To conform to CSA S269.1. Materials shall bear grade marks or be accompanied with certificates, test reports or other proof of conformity.
- .4 Formwork Release Agent: Shall be a proprietary material which will not stain the concrete or impair the natural bonding or color characteristics of coating intended for use on the concrete.
- .5 Form Ties: Removable or "snap off" metal ties, fixed or adjustable lengths, free of devices leaving holes larger than 25 mm [1"] diameter in the concrete surface.
- .6 Exposed Surfaces
  - .1 Form materials for concrete surfaces which require smooth and uniform surfaces for applied finishes or other purposes, shall consist of square edged smooth panels of plywood, metal or plastic. The panels shall be square and made in a true plane, clean, free of holes, surface markings and defects.
  - .2 Refer also to **Architectural Quality Concrete** later in this section.
- .7 Circular (Tubular) Column Forms
  - .1 Internally treated with release material.

Acceptable Types:

SONOTUBE .....by Sonoco  
POLI-PERMAFORM .....by Atlas Construction Specialties  
Other types subject to submission and acceptance.

- .2 Where required by the Architectural drawings and finish schedules provide lined forms so that no spiral line is visible in the finished concrete surface.

## .2 REINFORCING AND ACCESSORIES

### .1 Reinforcing Bars:

- .1 Shall be new deformed "Hi-Bond" bars conforming with CSA G30.18M with a minimum yield stress of 400 MPa [58 ksi]. All bars to have Typical Identification Patterns and standard identification requirements.
- .2 Epoxy coating is to conform to the specified standard, applicator is to be certified by RSIC.

- .2 Welded Wire Mesh: Unless otherwise approved shall be supplied in flat sheets only.

### .3 Chairs, bolsters, bar supports, side wall spacers and bar spacers:

- .1 Provide quantity for strength and support of the construction conditions, so that there is no possibility of displacement or deformation of the reinforcement during construction.
- .2 Use plastic chairs and/or sidewall spacers for all concrete.

Acceptable Types as supplied by:

Drummond & Reeves  
Acrow Richmond  
Superior Concrete

- .4 Tie Wires: Annealed wire 1.29 mm [0.05"] diameter (No.16 U.S. Standard Gauge), or heavier or an approved proprietary system.

- .5 Provide all necessary support bars and spacers in accordance with recommendations of the RSIC Manual.

## .3 READY MIX CONCRETE:

- .1 Unless otherwise specified, concrete shall be premixed, quality controlled conforming to CSA A23.1 with minimum 28 day compressive strengths as noted on the drawings.
- .2 Cement shall be Portland Cement of Canadian manufacture conforming to CSA A3000, Type GU (10).



- .3 Supplementary Cementing Materials shall conform to the requirements of CSA A3000.
- .4 Aggregates shall be clean, uncoated sand and coarse aggregates from approved sources conforming to CSA A23.1. Nominal size of coarse aggregate shall not exceed 20 mm [3/4"] unless otherwise stated on the structural drawings or specifications.
- .5 Water shall be potable from a municipal supply.
- .6 Chemical Admixtures, where permitted shall conform to the requirements of CSA A23.1.
  - .1 Provide an approved water-reducing agent in all concrete.  
Acceptable Types:  
  
EUCON WR .....by Euclid  
WRDA 82 .....by Grace  
PLASTOCRETE 161.....by Sika  
MASTERSET R 100 .....by BASF  
MASTERPOZZOLITH 210.....by BASF
  - .2 High Range Water Reducing Admixture (Super P)  
Acceptable Types:  
  
EUCON 37.....by Euclid  
WRDA 20.....by Grace  
SIKAMENT 686 .....by Sika  
MASTERRHEOBUILD 1000 .....by BASF  
MASTERGLENIUM 51.....by BASF
  - .3 Mid-Range Water Reducing Additive where approved for use:  
Acceptable Types:  
  
MASTERPOLYHEED 1020.....by BASF  
EUCON MR .....by Euclid  
DARACEM 55.....by Grace  
SIKAMENT 500 .....by Sika
  - .4 Air-Entraining Agent:  
Acceptable Types:  
  
EUCON AIR MAC6.....by Euclid  
DARAX AEA ED .....by Grace  
SIKA AIR .....by Sika  
MASTERAIR .....by BASF
- .7 Calcium chloride or chloride based admixtures **shall not** be used.

.8 Salt or other chemicals shall not be added to reduce the freezing point of concrete.

.9 All admixtures shall be used in strict accordance with the manufacturers' instructions.

.10 SYNTHETIC FIBRE REINFORCING

.1 Synthetic Fibre Reinforcing to control plastic shrinkage cracking: 100% virgin polypropylene fibres specifically manufactured for concrete reinforcement and containing no reprocessed materials. Fibres to be added at the concrete batching plant at the rate of 0.9 kg/m<sup>3</sup> [1.52 lb/yd<sup>3</sup>] of concrete for defibrillated fibres and 0.6 kg/m<sup>3</sup> [1.01 lb/yd<sup>3</sup>] for monofilament fibres, unless otherwise noted, in strict accordance with manufacturer's instructions.

Acceptable Types:

PSI FIBRESTRAND 150 .....by Euclid  
SIKAFIBER PPF-50 mm .....by Sika Canada Inc.  
MICROFIBRE .....by Grace  
MASTERFIBER .....by BASF

.11 Typical Concrete Mixes: See schedule on drawings.

.4 CONSTRUCTION GROUTS: Non-shrink grout unless otherwise noted shall be a premixed non-metallic, non-shrink grout.

Acceptable Types:

EUCO NS OR DRY PACK GROUT .....by Euclid  
M-BED STANDARD.....by Sika  
MASTERFLOW 555.....by BASF  
CG-86.....by W.R. Meadows  
CPD NON-SHRINK GROUT .....by CPD

.5 CURING, SEALING AND/OR CURING/SEALING COMPOUND where approved for use shall conform to ASTM C309.

.1 Acceptable Types:

MASTERKURE CC 300 XS.....by BASF  
FLORSEAL WB 25.....by Sika  
SUPER DIAMOND CLEAR 350 .....by Euclid  
CS-309-30.....by W.R. Meadows  
ACRYLIC CURE & SEAL 30% .....by CPD  
Compounds must be compatible with applied finishes.

.2 Compound used for Coloured Surface Hardened Finishes shall be:

- .1 SUPERDIAMOND (CLEAR) 350 FOR SURFLEX...by Euclid
- .2 FLORSEAL WB25 (CLEAR) FOR COLORPLETE...by Sika
- .3 MASTERKURE CC 300 XS .....by BASF

.3 For LEED Projects, use:

- EVERCLEAR VOX .....by Euclid
- VOCOMP 25 .....by W.R. Meadows

.4 Compounds applied at the rates as recommended by the manufacturers.

.6 SURFACE HARDENER: Unless otherwise noted shall be a non-metallic dry shake hardener.

Acceptable types:

- MASTERTOP 110ABR .....by BASF
- SURFLEX TR .....by Euclid
- DIAMAG 7.....by Sika
- CPD FLOOR HARDENER PRE-MIX .....by CPD

.1 Colour to be plain or natural.

.2 Coloured Surface Hardener acceptable types:

- SURFLEX FRENCH GREY .....by Euclid
- COLORPLETE FRENCH GREY .....by Sika

.7 PRE-MOULDED JOINT FILLERS: Provide bituminous impregnated fibreboard conforming to ASTM D1751.

Acceptable types:

- FIBRE EXPANSION JOINT FILLER .....by W.R. Meadows
- CPD ASPHALT FIBRE EXPANSION JOINT FILLER .....by CPD

.8 JOINT FILLER FOR "SAW-CUT" CONTROL JOINTS: Two component self-leveling sealant, minimum Shore A Durometer hardness of 80 at 20°C [68°F] as conforming to ASTM C661.

Acceptable types:

- MASTERSEAL CR 190..... by BASF
- EUCO QWIKJOINT UVR ..... by Euclid
- LOAD FLEX POLYUREA..... by Sika
- REZI-WELD FLEX ..... by W.R.Meadows
- CIPADAM E-13 ..... by CPD

**.9 VAPOUR RETARDER MEMBRANE FOR SLAB-ON-GRADE**

- .1** Provide a vapour retarder membrane cover over the prepared base material below slabs-on-grade where noted on the drawings.
- .2** Membrane shall have the following properties:
  - .1** Performance as tested after conditioning (ASTM E1745)
  - .2** Strength minimum CLASS B (ASTM E1745)
  - .3** Minimum thickness 0.25 mm [0.01"]
- .3** Lap joints minimum 150 mm [6"] and tape with material as recommended by membrane manufacturer.
- .4** Acceptable membrane types as manufactured by:
  - FLORPRUFE 120..... by Grace
  - STEGO WRAP ..... by Stego Industries
  - PERMINATOR ..... by W.R.Meadows
  - MOISTOP ULTRA ..... by Fortifiber Building Systems
- .10** Other materials or products which are not listed herein shall comply with the latest CSA, ASTM, CGSB, or ACI Standards appropriate to those materials. Refer to **Source Quality Assurance** in **PART 1** of this section.

**PART 3 – EXECUTION**

**3.1 Work by this Section as Supplied by Others**

- .1** Install anchors and other items to be cast into the concrete as supplied by others.

**3.2 Formwork**

- .1** Formwork design, materials, and erection shall conform with CSA A23.1 including all falsework and ties.
- .2** Column and wall footings and caps shall have plywood side forms. The placement of footings directly against neat cut excavations may be approved subject to review and acceptance by the Structural Consultant. Approval to proceed must be given in writing by the Structural Consultant before any concrete is placed.

**3.3 Reinforcing Fabrication and Placement**

- .1** Conform to CSA A23.1.

### **3.4 Concrete**

- .1 Mixing, Transportation and placement to conform to CSA A23.1.
- .2 Maximum time between adding mix water and complete discharge of concrete into forms shall be 120 minutes. Exemptions to this time frame shall only be permitted with approval by the Structural Consultant when previously approved chemical additives are used.
- .3 Approved synthetic fibres to be added to the concrete for slabs where noted on drawings. Refer elsewhere in this section for dosage rates and superplasticizers.

### **3.5 Cold Weather Conditions**

- .1 When the air temperature is at or below 5°C [41°F] or when there is a probability of its falling to that limit within 24 hours of placing (as forecast by the nearest weather office).

Conform to the requirements of CSA A23.1 including, but not limited to the following:

- .1 Job Preparation.
- .2 Concrete Temperature.
- .3 Concrete Placing.
- .4 Protection Requirements and Methods:
  - .1 Heated Enclosures.
  - .2 Protective Covers and Insulation.
- .5 Cooling after protection.
- .6 Cold-Weather Curing.
- .2 All materials and equipment needed for adequate protection and curing shall be on hand and ready for use before concrete placement has started.

### **3.6 Hot Weather Protection Requirements**

- .1 Conform to the requirements of CSA A23.1.

### **3.7 Finishing Treatment of Slab Surfaces (Screeding and Trowelling)**

- .1 Screeding, Bull Floating, Darbying, Trowelling.
  - .1 Conform with the requirements of Clause 7.6 of CSA A23.1 and as modified hereinafter.

- .2 Bring tops of floors to even level or sloping surfaces as shown on the drawings.
- .3 Slabs shall be finished only when bleed water on the slab surface has evaporated.
- .4 Machine trowel all floor slabs, except as required by the drawings and/or specifications to Class A Conventional (Smooth) classification.
- .5 Surfaces of exterior exposed steps and platforms shall be finished with a wood float and given a "fine broom" finish to the Consultant's satisfaction. (Class A Conventional (Smooth) classification). Refer also to Architect's "Finish Schedule".
- .6 Unless otherwise shown or specified, roof slabs shall be finished for waterproofing with a Steel Trowel Finish. (Class A Conventional (Smooth) Classification).
- .7 Floors to receive separate finishes shall be screeded to proper elevation, and wood float finished. (Class A Conventional (Smooth) Classification).
- .8 Class A Conventional (Smooth) Classification shall be as defined in CSA A23.1 Table 21 and shall be determined by F-number method as defined in Clause 7.6.1.1 unless otherwise directed.
- .9 Finished surfaces not conforming to the specified tolerances shall be deemed as **Defective Concrete**. See later in this section.

## .2 **Slab-On-Grade**

- .1 VAPOUR RETARDER MEMBRANE FOR SLABS-ON-GRADE
  - .1 For areas specified to receive on under slab membrane:
    - .1 Ensure that the prepared subgrade is approved by the Geotechnical Consultant.
    - .2 Level, tamp and/or roll the subgrade as required.
    - .3 Install the membrane in accordance with manufacturer's instructions and to ASTM E1643.
    - .4 Unroll membrane with the longest dimension parallel to the direction of the concrete pour.
    - .5 Lap membrane over footings and seal to foundation walls, columns and column caps etc., and overlap joints 150 mm [6"].
    - .6 Seal all penetrations (including pipes) and seal as per manufacturer's directions.

- .7 Repair damaged areas with membrane patches overlapping damaged areas by 150 mm [6"] and taping all four sides.

## .2 READY MIX CONCRETE

- .1 Refer to drawings and also to **Materials** in this section.
- .2 Synthetic Fibres: Refer to READY MIX CONCRETE earlier in this section.
- .3 Superplasticizer
  - .1 Where shown on the drawings and specifications as slabs to have superplasticizer added to the mix, the approved superplasticizing agent can be added at the site or at the plant subject to the appropriate mix design being submitted for review and approval issued by the consultant. NO WATER IS TO BE ADDED AT SITE.
  - .2 As an alternative, the specified Mid-Range Water Reducing additive, added at the batching plant, may be approved for use. Subject to the appropriate mix design being submitted for review and approval issued by the Consultant.
- .4 Quantities and procedure for admixtures shall be determined and supervised with the assistance of the manufacturer's technical staff.

## .3 EXECUTION

- .1 Refer to **Field Quality Control** later in this section.
- .2 Obtain Geotechnical Consultant's approval of the granular fill before placing the concrete slabs-on-grade.

- .4 Provide screeds set to an engineer's level for leveling the surface of floor slabs-on-grade.

- .5 Provide keys or dowels at construction joints as detailed on the drawings.

## .6 CONTROL JOINTS

- .1 Where shown on plans or on Typical Details, provide saw-cut control joints as indicated.
- .2 Control joints in slabs-on-grade shall be cut using power driven abrasive or diamond tipped blades.

- .3 Cutting shall begin as soon as the concrete surface has hardened sufficiently to resist raveling as the cut is made and before shrinkage cracks form in concrete. Generally, saw-cutting of slabs-on-grade shall be done within the first 24 hours after the slabs are placed. Alternatively, use the Soff-Cut method immediately after finishing the slab.
- .4 The depth of control joints shall be one-third (1/3) of the thickness of the slab, with a minimum of 40 mm [1.5"] unless otherwise noted.
- .5 Clear saw-cuts of all debris and ensure sides are clean and dry before proceeding.
- .6 Mix saw-cut joint filler according to manufacturer's instructions.
- .7 Pour filler into joints, flush with adjacent surfaces.

### **.3 Surface Hardened Finishes**

- .1 For slabs designated to be surface hardened, apply the specified surface hardener in strict accordance with the manufacturer's instructions at a rate of 5.0 kg/m<sup>2</sup> [1.00 lb/ft<sup>2</sup>].

## **3.8 Finishing of Formed Surfaces**

- .1 Conform to the requirements of CSA A23.1 Clause 7.9.
- .2 Refer to Architectural Finish Schedules and Drawings.
- .3 Refer to **Architectural Quality Concrete** later in this section.

## **3.9 Sealing and Curing**

- .1 Apply specified compounds in strict accordance with manufacturer's directions.
- .2 All floor slabs and all EXPOSED concrete surfaces, such as walls, beams, columns, etc., are to receive a minimum of one coat of curing and sealing compound unless not compatible with architectural finishes.

### **.3 CURING**

- .1 Conform to the requirements of CSA A23.1 including but not limited to the following:
  - .1 Basic curing period.
  - .2 Additional curing for durability.
  - .3 Additional curing for structural safety.



- .4 Methods for curing.
- .5 Cold weather curing.
- .6 Hot weather curing.
- .7 Curing for Accelerated Strength Development.

- .4 Refer also to **Cold Weather Conditions** and **Hot Weather Protection Requirements**, elsewhere in this section.

### **3.10 Protection of Slab Surfaces**

- .1 Fully protect exposed concrete finishes from damage and staining.
- .2 Protect all exposed surfaces from dropping plaster, welding debris, paint, dirt or other marring agents, by heavy building paper, tarpaulins or other appropriate means. The surface must be perfectly dirt-free before this protection is placed.
- .3 Do not allow any pipe threading or similar machines using oil or other permanently staining liquid on any concrete floor unless set up on large oil-tight and properly constructed metal pans. Plywood sheets or other absorbent materials will not be permitted as a substitute for pans.

### **3.11 Miscellaneous Items**

- .1 This section to provide and place concrete, formwork and reinforcing and/or grout fill for all concrete work shown on or implied by the drawings and specifications.
- .2 DRY-PACK GROUT: Provide and install specified non-shrink grout as required, in accordance with manufacturer's directions.
- .3 REINFORCED MASONRY LINTELS: Where required, provide reinforcing and place concrete in accordance with the Typical Notes and Details on the drawings.
- .4 VERTICAL MASONRY WALL REINFORCING BARS: Provide, for installation by the Mason, bars as required by the drawings and typical details.
- .5 MASONRY GROUT: Co-ordinate with the Mason for supply and installation of grout. Grout as specified on the drawings.
- .6 BONDING AGENT: Provide and install specified agent as required in accordance with manufacturer's directions.
- .7 DRILLED AND SET ANCHORS AND DOWELS:  
  
Provide and install the specified products and materials as required in accordance with manufacturer's directions. Refer also to Post Installed Anchors Specification 05 05 19.

### **3.12 Architectural Quality Concrete**

Where concrete surfaces are denoted as Architectural Quality or Architectural Finished Concrete, comply with the following:

- .1 Refer to MATCH SAMPLE FOR ARCHITECTURAL QUALITY CONCRETE earlier in this section.
- .2 Use same formwork and joint sealing on final work as was used on "Match" sample.
- .3 Conform with the requirements of CSA A23.1 Clause 8.3 and ACI 303.
- .4 DESIGN
  - .1 The mix shall be designed by the Contractor so that it will achieve all the properties specified and in addition will achieve a high workability.
  - .2 Regardless of specified strength, architectural concrete exposed to weather shall have a maximum water cement ratio of 0.48 by mass.
  - .3 The maximum slump permitted is 90 mm [3.5"].
  - .4 Take care to reduce variation in mix proportions and particularly the quality of water used in various batches, in order to ensure reasonable colour uniformity of concrete.
- .5 Architectural quality concrete shall meet the standards set out below when the forms are stripped, without further finishing work other than treatment of tie holes and clean-up:
  - .1 Dense, even concrete, uniform in colour and free of defects such as colour change, honeycombing, voids, loss of fines, flow lines, cold joint lines or other similar imperfections. Patching, unless it is required to only an insignificant extent, will not be permitted to repair these defects. Where patching is permitted, it must accurately match the colour and texture of the surrounding concrete to be acceptable. The judgement as to what constitutes insignificant defects which may be patched and the acceptance of the patch shall be made solely by the Architect.
  - .2 Concrete members of generally uniform colour.
  - .3 Concrete members with true, accurate definition at corner, arises, reglets and the like, generally free of chipped or spalled areas and within dimensional tolerances set out in ACI 303.
  - .4 Weathertight construction joints in members exposed to weather.

- .5 Under no circumstances shall patches or repair to any architectural concrete be undertaken without the Architect's written consent. Concrete members which are patched without the Architect's consent will be classified as defective work and the Architect may require their removal and replacement.
- .6 Colour and texture matching the sample panel designated by the Architect.
- .6 FORMS
  - .1 Use approved cone type form ties, spaced as required by the Architect. Align vertical and horizontal form panel joints.
  - .2 Seal joints on exterior side between form panels with an approved joint seal and securely fasten 25 x 50 mm [1" x 2"] wood battens over each joint seal.
  - .3 Provide formwork for reveals as detailed on the architectural drawings to the Architect's satisfaction.
- .7 SANDBLAST FINISH: Where denoted.
  - .1 Sandblast the exposed surface of concrete members as required to a depth sufficient to at least remove the surface skin and expose the coarse aggregate and match the approved sample designated by the Architect.
  - .2 Sandblast individual concrete members at the same age to ensure reasonable colour uniformity. Protect adjacent surfaces not noted to be sandblasted.
  - .3 Do not proceed with sandblasting operations until the Architect has inspected and approved the surfaces to be sandblasted.
- .8 When specified or shown on the drawings fill form tie holes with Mills gray concrete plugs in strict accordance with the manufacturer's recommendations.

### **3.13 Defective Concrete**

- .1 Concrete not meeting the requirements of the specifications and drawings shall be considered defective concrete.
- .2 Defective concrete and concrete not conforming to lines, details, quality and grade specified or as shown on the Drawings shall be modified or replaced at no extra cost to the Owner, and to the satisfaction of the Architect.
- .3 Finished lines, dimensions and surfaces shall be correct and true within tolerances specified.

- .4 Non-exposed Surfaces: Honeycombing shall be cut out and filled and any fins which interfere with strapping, etc., shall be cut back. Holes left by form separators shall be filled.
- .5 Crack Repair: After concrete has cured, examine concrete floor surfaces and repair all cracks. Route out cracks with mechanical router to a minimum depth of 13 mm [1/2"]. Then clean and fill cracks in same manner as control joints.
- .6 Use approved curing/sealing compound in strict accordance with manufacturer's recommendations.

### **3.14 Quality Control**

- .1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.
- .2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.
- .3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner and Consultants of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility. The contractor is solely responsible for quality control and shall implement its own supervisory and quality control procedures.
- .4 Refer to **Source Quality Assurance** included in this section.
- .5 If requested, provide a copy of the Concrete Suppliers Certificate confirming that the specified fibre reinforcement at the specified dosage was added to all required concrete delivered to the job site.

### **3.15 Notification**

- 1. Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective. A minimum notification of 24 hours in advance of placing concrete is required.

### **3.16 Inspection and Testing**

1. The General Contractor in agreement with the Prime Consultant will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.
2. The Inspection and Testing Company will conduct inspection and testing services per Specification Section 01 45 23 – *Testing and Inspection Services – General Requirements*
3. The following are responsibilities of the contractor regarding the Inspection and Testing Company:
  - .1 Co-operate with the representatives of the Inspection and Testing Company.
  - .2 Provide the Inspection and Testing Company with a set of construction documents to enable them to understand the scope of their services.
  - .3 Provide an insulated storage box according to the specification and drawing supplied by the Inspection and Testing Company.
  - .4 Protect test cylinders.
  - .5 Keep a record set of drawings upon which shall be marked by the contractor's superintendent, the time and date of pouring of each section of concrete, the date of removal of forms and a daily record of the temperature.

### **3.17 Defective Materials and Work**

- .1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.
- .2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

- .3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 03 30 53

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

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

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 1.6 Delivery, Storage, and Handling
- .7 1.7 Field Conditions
- .8 2.1 Materials
- .9 3.1 Workmanship
- .10 3.2 General Erection Tolerances
- .11 3.3 Laying Masonry Units
- .12 3.4 Exposed Masonry
- .13 3.5 Jointing
- .14 3.6 Built-In *Work*
- .15 3.7 Reinforced Masonry
- .16 3.8 Provision for Movement
- .17 3.9 Loose Lintels
- .18 3.10 Lateral Supports
- .19 3.11 Movement (Control) Joints
- .20 3.12 Temporary Bracing
- .21 3.13 Field Quality Control
- .22 3.14 Adjusting and Cleaning
- .23 3.15 Protection

### **1.3 SUMMARY**

Masonry procedures for masonry work.

### **1.4 SUBMITTALS**

Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.

*Product* data sheets:

- .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in masonry assemblies.

Shop Drawings:

- .2 Submit *Shop Drawings* for masonry unit wall assemblies indicating:

- .1 Proposed locations of 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 from the *Consultant*: Layout using full brick masonry units.

Samples:

- .3 Two of each type of brick masonry unit specified.
- .4 Two of each type of concrete masonry unit specified.
- .5 Two of each type of architectural concrete masonry unit specified including corner units and in varying degrees of "roughness" or texture.
- .6 One of each type of masonry accessory specified
- .7 One of each type of masonry reinforcement and tie proposed for use.

Masonry reinforcing and connector certification: The *Contractor* shall submit the manufacturer's written certification that masonry reinforcing and connector *Products* supplied for the masonry parts of the *Work*, comply with CAN/CSA A370-15. The Contractor shall ensure that the Certification is typewritten and signed on manufacturer's letterhead and includes a lists and quantities of reinforcing and connector *Products* provided in the *Work*.

## 1.5 QUALITY ASSURANCE

Qualifications:

- .1 Installers / applicators / erectors: *Provide* work of this Section, executed by competent installers with a minimum five years' experience in application of products, systems and assemblies specified and with approval of *Product* manufacturers.

Mock-ups:

- .2 *Provide* mock-ups in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Quality control mock-ups for masonry veneer walls:
  - .1 Construct mock-up panel of each type of masonry veneered wall construction 2000 mm x 2000 mm (78" x 78") at locations designated by the *Consultant* showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar colours and workmanship.
  - .2 Select masonry units for use in mock-ups that represent the maximum variation in texture and colour.
  - .3 Mock-up shall remain in place until acceptance of masonry and as directed by the *Consultant*.

Accepted mock-ups may not remain as part of the completed *Work*.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the *Place of the Work* in dry condition.

Keep materials dry until use.



Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

## 1.7 FIELD CONDITIONS

Cold weather construction requirements:

- .1 Comply with requirements of CAN/CSA A371-04, and as follows:

Air Temperature	General requirements during construction
0 to 4.....	Sand or mixing water shall be heated to a minimum of 20°C and a maximum of 70°C.
-4 to 0.....	Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C.
-7 to -4.....	(1) Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C. (2) Source heat shall be provided on both sides of the walls under construction. (3) Windbreaks shall be employed when the wind speed exceeds 25 km/h.
-7 and below.....	(1) Sand and mixing water shall be heated to a minimum of 20°C and a maximum of 70°C. (2) Enclosures and supplementary heat shall be provided to maintain an air temperature above 0°C. (3) The temperature of the unit when laid shall be not less than 7°C.

.2 Grout shall be placed in masonry at a minimum temperature of 20°C and a maximum temperature of 50°C.

.3 Mortar temperature shall not exceed 50°C to avoid flash set.

.4 Maintain dry beds for masonry and use dry masonry units only. Do not wet masonry units in winter.

Cold weather protection requirements:

- .5 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

Hot weather construction requirements:

- .6 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.
- .7 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

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.

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.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

Mortar and grout for masonry: in accordance with Section 04 05 13 – Mortar and Grout for Masonry.

Masonry reinforcement and connectors: in accordance with Section 04 05 19 – Masonry Reinforcement and Connectors.

Masonry accessories: in accordance with Section 04 05 23 – Masonry Accessories.

Brick masonry units: in accordance with Section 04 21 00 – Brick Masonry Units.

Concrete masonry units: in accordance with Section 04 22 00 – Concrete Masonry Units.

Architectural concrete masonry units: in accordance with Section 04 22 00 - Concrete Masonry Units.

## **PART 3- EXECUTION**

### **3.1 WORKMANSHIP**

Build masonry plumb, level, and true to line, with vertical joints in proper alignment. Lay masonry to tolerances specified in CAN/CSA A371-04.

Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

Masonry mortar and grout work: in accordance with CAN/CSA A179-04 except where specified otherwise.

Masonry work: in accordance with CSA S304.1-04, CAN/CSA A370-15 and CAN/CSA A371-04 except where specified otherwise.

### **3.2 GENERAL ERECTION TOLERANCES**

Lay masonry units with required mortar joint thickness specified below, not to exceed 12.7 mm (1/2").

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 story or 6 m (20') maximum.
- .2 12.7 mm (1/2") in 12 m (40') or more.
- .3 Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
  - .1 6.4 mm (1/4") in any bay or 6 m (20').
  - .2 12.7 mm (1/2") in 12 m (40') or more.
- .4 Maximum variation from plan location of related portions of columns, walls and partitions:
  - .1 12.7 mm (1/2") in any bay or 6 m (20').
  - .2 19 mm (3/4") in 12 m (40') or more.
- .5 Maximum variation in cross-sectional dimensions of columns and thicknesses of walls from dimensions shown on the *Drawings*:
  - .1 Minus 6.4 mm (1/4").
  - .2 Plus 12.7 mm (1/2").
- .6 Where masonry surfaces serve 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

Coursing design:

- .1 Brick masonry units: Fifty percent running bond.
- .2 Concrete masonry units: 1/3 running bond.
- .3 Architectural concrete masonry units: Fifty percent running bond.

Installation and materials shall meet or exceed that of accepted samples and mock-up.

Units shall be cut only upon acceptance by the *Consultant*. Walls are to be laid-up with full size masonry units.

Keep cavity space at cavity and/or veneer walls clear of mortar droppings and debris.

Remove loose and foreign materials from supporting bed surfaces to ensure bonding.

Do not tooth at wall terminations. Rake back ½ unit length where stop-off occurs in horizontal run of masonry.

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').

Do not install defective, cracked, and broken masonry units.

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.

Maintain bracing of walls and piers continuously during construction until structure provides support.

Locate bearings and piers as indicated on the Shop drawings. *Provide* solid masonry units at bearings. Grout under bearing plates installed on masonry with non-shrink grout.

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.

Grouted reinforced masonry: incorporate reinforcing steel and construct masonry to indicated on the Shop drawings requirements.

Lay masonry level, true to line, square, plumb, and as indicated on the Shop drawings. Lay masonry courses in vertical alignment to ensure vertical joints align for full height of masonry and full height of building face.

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.

Fully bond intersections, and external corners.

Do not adjust masonry units after placement. Where resetting of masonry is required, remove units, clean and reset in new mortar.

Cut masonry around obstructions, leaving maximum joint size as specified in this Section (below).

Build chases, do not cut them.

Lay hollow concrete masonry units so that shells rest and align.

Exposed cuts shall be made clean and true with a suitable masonry saw.

### 3.4 EXPOSED MASONRY

Do not lay chipped, cracked, blemished, and otherwise damaged units in exposed masonry.

Do not lay chipped, cracked, and otherwise damaged units in concealed masonry.

Do not lay concrete masonry units that will appear smooth or slick where exposed to view, whether painted or not finished.

Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.

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

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.

Tool with non-staining pointing tool to *Provide* smooth, compressed, uniformly formed joints as follows:

- .1 For exposed brick masonry: Concave.
- .2 For exposed concrete unit masonry: Concave.
- .3 For exposed architectural concrete unit masonry: Concave.

- .4 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.
- .5 Joint thickness:
  - .1 Maintain mortar joint thickness of 10 mm (3/8"), unless otherwise specified or indicated on the Shop drawings.
  - .2 At masonry cut around obstructions: maximum joint size of 13 mm (1/2").

Make joints of uniform thickness with vertical joints in alignment.

Trowel point joints in unparged masonry at below grade locations in contact with earth.

Form reglets where indicated on the Shop drawings for metal flashing in masonry.

Remove loose or defective mortar when masonry is removed and replace.

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 – Joint Sealants.

### 3.6 BUILT-IN WORK

Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.

Coordinate and cooperate in the provisions for setting, anchorage and alignment of built-in work.

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 on the Shop drawings.
- .4 Protect frame with protective covering and leave no mortar on exposed frame faces.

### 3.7 REINFORCED MASONRY

Conform to requirements of CAN/CSA A371-04.

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.

Reinforced block lintels:

- .1 Install reinforced block lintels over doorways, other openings and recesses as indicated on the Shop drawings.
- .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.

### 3.8 PROVISION FOR MOVEMENT

Deflection space:

- .1 Incorporate deflection space between tops of non-load-bearing walls/partitions and structure to prevent transference of structural loads to masonry.
  - .1 Exterior masonry wall deflection space: 12.7 mm (1/2").
  - .2 Interior masonry partition deflection space: 25 mm (1").
- .2 Coordinate work of this Section with installation of lateral supports.

### 3.9 LOOSE LINTELS

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 the *Contract Documents*, *Provide* horizontal and vertical wall and partition lateral support anchors in accordance with CAN/CSA A370-15.

### 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 control (movement) joints to top of masonry, including parapets.
- 5. Review and coordinate control joint locations with the *Consultant* prior to installation of masonry.

### 3.12 TEMPORARY BRACING

*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

Conduct quality control in accordance with Section 01 45 00 – Quality Control and perform field control tests in accordance with CSA S304.1-04.

### 3.14 ADJUSTING AND CLEANING

Protect masonry and adjacent work from damage from cleaning work.

Clean masonry in accordance with masonry manufacturer's printed instructions. Remove masonry and install new masonry, if masonry is damaged by cleaning work, at the *Contractor's* expense.

Test cleaning agent and procedures by cleaning small, inconspicuous sample location prior to commencement of overall cleaning work. Review cleaning test area with the *Consultant* and obtain acceptance in writing prior to cleaning remainder of areas requiring cleaning.

Soak wall with clean water and flush off loose dirt and mortar.

Apply specified cleaning agent in accordance with the manufacturer's direction, working from top to bottom.

Rinse areas thoroughly with clean water to remove cleaning solutions, dirt, and mortar residue.

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.

Remove mortar droppings from flashings and other materials immediately to prevent damage and discolouration.

Remove efflorescence and mortar deposits from surfaces to receive coatings or surfaces which are exposed to view, occurring within a time period of one year from the date of *Substantial Performance of the Work* as required by the *Consultant* or the *Owner*.

### 3.15 PROTECTION

Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

Protect other materials and finishes from contamination by mortar droppings.

*Provide* temporary bracing of masonry work during and after erection until permanent lateral support is in place.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Delivery, Storage, and Handling
- .6 1.6 Field Conditions
- .7 2.1 Materials
- .8 2.2 Material Source
- .9 2.3 Mortar Types
- .10 2.4 Mortar Colour
- .11 2.5 Grout Types
- .12 3.1 Masonry Procedures
- .13 3.2 Measurement and Mixing
- .14 3.3 Grout
- .15 3.4 Field Quality Control
- .16 3.5 Protection

### **1.3 SUMMARY**

- .1 Mortar and grout for masonry work.
- .2 Pigmented mortar at following masonry assemblies; locations as indicated on the Shop drawings:
  - .1 Brick masonry units.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 04 05 00 – Masonry Procedures.
- .2 Test and evaluation reports: Submit test results confirming compliance of aggregates with CAN/CSA A179-04.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Protect cementitious materials against moisture.
- .2 Prevent contamination by foreign materials, and freezing.

### **1.6 FIELD CONDITIONS**

- .1 Heat materials as follows to produce mortar temperature between 4°C and 50°C:



- .1 When air temperature is between 4°C and 0°C, heat either sand or water to produce specified mortar temperature.
- .2 When air temperature is below 0°C, heat both sand and water to produce specified mortar temperature.
- .3 Do not heat water or sand above 50°C.
- .4 Produce mortar batches subsequent to the first within plus 6°C of the first.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Mortar and grout: Comply with CAN/CSA A179-04.
- .2 Portland cement: in accordance with CSA A3001-08, Type 10. For exposed mortar, maintain uniformity of cement manufacturer and batch for colour uniformity.
- .3 Hydrated lime: in accordance with ASTM C207-06(2011), Type S.
- .4 Sand: in accordance with CAN/CSA A179-04.
- .5 Mortar pigment:
  - .1 Mortar colours shall contain pure, concentrated mineral pigments especially processed for mixing into mortar and complying with ASTM C979-05.
  - .2 Allow for blended mortar pigment colours to match each type of masonry veneer.
    - .1 Colours: to be selected by *Consultant*.
      - .1 Colours shall be selected from full pricing range.
    - .2 Loading (% of cementing material):
      - .1 3% (half loading).
      - .2 6% (full-loading).
  - .3 Acceptable manufacturers:
    - .1 Davis Colors 'True Tone Sweet 16 Cement Colors'.
    - .2 Lanxess Corporation 'Bayferrox Iron Oxide Pigments'.
    - .3 Solomon Colors, Inc. 'Concentrated Mortar Colors'.
    - .4 Or *Equivalent*.

### **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:
  - .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 for interior masonry:
  - .1 Loadbearing: Type S.
  - .2 Non-loadbearing: Type N.

## **2.4 MORTAR COLOUR**

- .1 Mortar colour; for use as indicated on the Shop drawings:
  - .1 Except where pigmented mortar is specified or indicated: Control mortar materials and workmanship to produce uniform grey colour (non-pigmented).

## **2.5 GROUT TYPES**

- .1 Grout for masonry: Grout in accordance with CAN/CSA A179-04.
  - .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 in accordance with 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 – Masonry Procedures as supplemented in this Section.
- .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. 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 – Masonry Procedures, CAN/CSA A371-04, and as indicated on the Shop drawings.

### **3.4 FIELD QUALITY CONTROL**

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

### **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 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 2.1 Materials
- .6 3.1 Control Joints
- .7 3.2 Horizontal Reinforcing
- .8 3.3 Masonry Veneer Connectors
- .9 3.4 Reinforced Masonry
- .10 3.5 Bolts and Anchors
- .11 3.6 Lateral Support and Anchorage

### **1.3 SUMMARY**

- .1 Masonry reinforcing and anchorage.
- .2 Connectors for anchorage of masonry veneer to the following support assemblies:
  - .1 Concrete unit masonry.
  - .2 Wind bearing metal studs.
- .3 Horizontal reinforcing for masonry block wall and partition assemblies.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 04 05 00 – Masonry Procedures.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 General: in accordance with the Ontario Building Code (as amended) and CAN/CSA A370-15.
- .2 Corrosion protection; metal materials: in accordance with the Ontario Building Code and CAN/CSA A370-15:
  - .1 Hot dipped after fabrication in accordance with ASTM A1064/A1064M-15, and ASTM A153/A153M-09 Class B2 (457 g/m2).
    - .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: Acceptable manufacturers:

- .1 Blok-Lok Limited
- .2 Or *Equivalent* (substitutions in accordance with Section 01 25 00 – Product Substitution Procedures).
  - .1 Exterior wall assemblies: 4.75 mm (3/16") wire, welded rod, ladder design unless otherwise indicated.
  - .2 Interior wall assemblies: 9 gauge mill galvanized wire ladder reinforcement.
- .4 Exterior masonry veneer connectors for connection to concrete masonry unit back-up:
  - .1 Description: Stainless steel ASTM A666-15 Type 304 or 316 formed plate construction, wire V-TIE or TRI-TIE or equivalent masonry veneer connector (4.76 mm (3/16") cold drawn stainless steel Type 304 or 316 in accordance with ASTM A580/A580M-15), stainless steel or polyethylene insulation securement plates for insulation sheathing:
  - .2 Acceptable Products:
    - .1 Fero 'Slotted Block Tie (Type 1)'.
      - .2 Or *Equivalent*.
- .5 Masonry veneer connectors; stud back-up (installed on top of air barrier membrane and sheathing material):
  - .1 Description: Stainless steel ASTM A666-15 Type 304 or 316 plate construction, wire V-TIE or TRI-TIE masonry veneer connector (4.76 mm (3/16") cold drawn stainless steel Type 304 or 316 to ASTM A580/A580M-15), stainless steel or polyethylene insulation securement plates for insulation sheathing:
  - .2 Acceptable Products:
    - .1 Blok-Lok Limited 'BL-407'.
    - .2 Fero 'Slotted Rap-Tie'.
    - .3 Or *Equivalent*.
  - .3 Fasteners: minimum of 2 screws per tie, No. 12, Climaseal or equivalent coated galvanized steel, self-drill type, #10 minimum.

## **PART 3 - EXECUTION**

### **3.1 CONTROL JOINTS**

- .1 Stop reinforcing 25 mm (1") short of each side of control 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.
  - .2 Place reinforcement continuously in horizontal joints at vertical spacing not exceeding 400 mm (16"), beginning with course 400 mm (16") above bearing, unless otherwise indicated.

- .3 Do not carry reinforcement through intersections where lateral support anchors are installed, at intersections of walls and partitions with solid piers and at block control 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 MASONRY VENEER CONNECTORS

- .1 Tie masonry veneer to structural backing in accordance with CAN/CSA A370-15 with masonry veneer connectors at following maximum spacing:
  - .1 Maximum spacing unless otherwise indicated: 600 mm (24") vertically x 820 mm (32") horizontally.
  - .2 Stud back-up assemblies: 600 mm (24") vertically and 400 mm (16") horizontally. Ties are permitted be staggered horizontally on alternating studs provided the stud spacing does not exceed 410 mm (16") o.c. and the resulting horizontal tie spacing does not exceed 820 mm (32") o.c. The stagger shall be arranged so that all studs have ties including the top row of ties.
  - .3 At openings in masonry walls: 600 mm (24") apart around opening, and not more than 300 mm (12") from edge of opening.
  - .4 At tops and bottoms of walls: 300 mm (12") from edge of top of wall, and 400 mm (16") from edge of bottom support.
  - .5 At movement joints: 300 mm (12") from joint.

### 3.4 REINFORCED MASONRY

- .1 Reinforce masonry lintels and bond beams as indicated on the Shop drawings. 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 – Submittal Procedures.
- .4 *Provide* minimum 150 mm (6") bearing on supports for lintels.
- .5 Place 100% solid block at each jamb under lintels.

### 3.5 BOLTS AND ANCHORS

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

### 3.6 LATERAL SUPPORT AND ANCHORAGE

- .1 Install lateral support and anchorage in accordance with CAN/CSA A370-15 and as indicated on the structural *Drawings*.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 2.1 Materials
- .6 3.1 Masonry Installation and Procedures
- .7 3.2 Control Joints
- .8 3.3 Vents
- .9 3.4 Masonry Flashing
- .10 3.5 Deflection Space Filler
- .11 3.6 Slip Sheet at Metal Lintels
- .12 3.7 Shelf angle supports and Shelf angles

### **1.3 SUMMARY**

- .1 Control joint filler at masonry veneer.
- .2 Weep vents at cavity masonry veneer. Deflection space filler at top of non-fire rated masonry partitions.
- .3 Deflection space filler at top of fire-rated masonry partitions.
- .4 Preformed control joint filler at concrete walls/partition assemblies.
- .5 Slip-sheet membrane for steel lintel bearing over masonry to allow lintel movement (thermal expansion/contraction).

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 04 05 00 – Masonry Procedures.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Control joint filler at masonry veneer: sealant and backer rod in accordance with Section 07 92 00 – Joint Sealants.
- .2 Weep vents: Full height of masonry unit, designed to keep weep hole open for passage of air and water, UV stabilized polypropylene.
  - .1 Size: Height of head joint x depth of masonry unit x thickness of mortar joint.
  - .2 Colour: to later selection by the *Consultant* from manufacturer's full range.

- .3 Acceptable *Product*:
  - .1 Advanced Building Products, Inc. 'Mortar Maze Cell-Vents'.
  - .2 Blok-Lok Limited 'Cell-Vent'.
  - .3 Mortar Net Solutions 'CellVent'.
  - .4 Wire-Bond 'Cell-Vent'.
  - .5 Or *Equivalent*.
- .3 Deflection space filler (non-fire rated walls):
  - .1 Acceptable *Product*:
    - .1 Johns Manville 'MinWool Sound Attenuation Fire Batts'.
    - .2 Roxul "AFB".
    - .3 Or *Equivalent*.
  - .4 Deflection space filler (fire rated walls):
    - .1 Mineral type in accordance with Section 07 84 00 – Firestopping and Smoke Seals.
  - .5 Control joint filler; concrete block wythes:
    - .1 PVC, designed to fit into sash grooves.
    - .2 Acceptable *Product*: Blok-Lok Limited 'VS Series' or *Equivalent*.
  - .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 Limited 'Flex-Flash'.
      - .2 Lexcor F20.
      - .3 Or *Equivalent*.
  - .7 Shelf angle supports and Shelf angles
    - .1 Shelf angle supports: FAST Thermal Bracket System, consisting of FAST Thermal [Standard, Lintel, Inverted, TTS, or other custom] Brackets, Rectangular Washers, Shim Rods, and Shim Plates.
      - .1 All components manufactured by FERO Corporation, Edmonton, AB.
      - .2 FAST Thermal Bracket sized accordingly to shelf angle size.
      - .3 FAST Thermal Bracket sized accordingly to anchor diameter (anchor typically determined by EOR).
      - .4 FAST Thermal Bracket sized accordingly to suit wall assembly.



- .5 FAST Thermal Bracket to not exceed maximum spacings listed in FERO published load table and technical information, unless directed otherwise by a professional engineer registered or licensed in the local jurisdiction.
- .2 Shelf angles: FERO FAST Punched Angle to be used above openings with FAST™ Thermal Lintel Brackets hot dipped galvanized angle to be used with the FAST™ Thermal Standard Brackets
  - .1 FERO FAST Punched Angle to be manufactured by FERO Corporation, Edmonton, AB.
  - .2 Shelf angles for the Standard FAST Thermal Brackets can be supplied locally
  - .3 Installer is responsible for sizing FAST™ system to suit wall assembly and field conditions.
- .3 FAST Thermal Bracket depth to fill wall cavity or as shown in construction documents.
- .4 FAST Thermal Bracket height to meet anchor to shelf and distance.
- .5 FERO shim plates to be used for meeting construction tolerances.
- .6 Installer to install FAST Thermal Bracket System in compliance with FERO published technical documentation.
- .7 Shelf angle thickness and FAST Thermal Bracket anchorage requirements to be designed by a professional engineer registered or licensed accordingly to local jurisdiction.
- .8 All shop drawings relating to shelf angle supports and shelf angles to be reviewed and stamped for approval by a professional engineer registered or licensed accordingly to local jurisdiction, which can be done by contractor or delegated to FERO.
- .9 All components to be hot dipped galvanized after fabrication to meet the requirements of ASTM A123 and CSA A370-14.

### **PART 3 - EXECUTION**

#### **3.1 MASONRY INSTALLATION AND PROCEDURES**

- .1 Masonry installation and procedures shall be in accordance with Section 04 05 00 – Masonry Procedures, as supplemented in this Section.

#### **3.2 CONTROL JOINTS**

- .1 Keep control joints clear for application of joint sealants.
- .2 *Install* control joint filler in accordance with manufacturer's recommendations.

#### **3.3 VENTS**

- .1 *Install* weep vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at uniform and consistent horizontal spacing not exceeding 610 mm (24"). Do not locate vents within 610 mm (24") adjacent to corners of buildings.

#### **3.4 MASONRY FLASHING**

- .1 General: *Install* embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated on the Shop drawings.
- .2 *Install* flashing as follows unless otherwise indicated on the Shop drawings:

- .1 *Install* flashings in masonry in accordance with CAN/CSA A371-04.
- .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 masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and project face of sheathing or inner wythe minimum of 150 mm (6"); with upper edge tucked under air/vapour barrier membrane and fully adhered to substrate unless otherwise indicated on the Shop drawings, lap joints minimum of 100 mm (4").
- .4 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.
- .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.

### **3.5 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 – Firestopping and Smoke Seals.

### **3.6 SLIP SHEET AT METAL LINTELS**

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

### **3.7 SHELF ANGLE SUPPORTS AND SHELF ANGLES**

- .1 Install in accordance with manufactures recommendations and the Contract Documents.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 2.1 Materials
- .6 3.1 Laying

### **1.3 SUMMARY**

- .1 Clay brick.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 04 05 00 – Masonry Procedures.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Manufacture: Manufacture total required brick in one continuous batch, for maximum colour and texture uniformity.
- .2 Clay brick:
  - .1 Exterior kiln fired clay brick veneer: in accordance with CAN/CSA A82.1-M87.
    - .1 Grade SW.
    - .2 Type: FBX.
  - .2 Size: King Size: 67 mm x 76 mm x 244 mm (2-5/8" x 3" x 9-5/8").
  - .3 Acceptable *Product*: 'Endicott Medium Ironspot Velour #77' complete with pigment mortar, as distributed by Thames Valley or *Equivalent*.

## **PART 3 - EXECUTION**

### **3.1 LAYING**

- .1 Lay masonry in accordance with good practice, CAN/CSA A371-04 and as accepted in mock-up sample wall and as specified in Section 04 05 00 – Masonry Procedures.
- .2 Review locations of coursing alignment and layout with the *Consultant*, and seek approval, prior to commencement of the work of this Section.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

.1	PART 1 – GENERAL	1
.1	1.1 Section Includes	1
.2	1.2 requirements	1
.3	1.3 submittals	1
.2	PART 2 – PRODUCTS	1
.4	2.1 manufactured units	1
.5	2.2 installation	1
.6	2.3 cleaning	1

### **1.3 REQUIREMENTS**

- .1 Comply with the General Conditions, the Supplementary Conditions, and all of Division 1 General Requirements.

### **1.4 SUBMITTALS**

- .1 Submit all required submittals in accordance with Section.
- .2 Product Data: Submit manufacturer's product data sheets and installation instructions.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURED UNITS**

- .1 **Masonry Stone - Noble Block, by Permacon Group Inc.**
  - .1 **Type 1: 10 x 20 x 60 standard block, Parchment Beige, buffed finish.**
  - .2 **Type 2: 10 x 10 x 60 Ashlar block, Parchment Beige, buffed finish.**

### **2.2 INSTALLATION**

- .1 Lay masonry in accordance with good practice, CAN/CSA A371-04 and as accepted in mock-up sample wall and as specified in Section 04 05 00 – Masonry Procedures.
- .2 Review locations of coursing alignment and layout with the *Consultant*, and seek approval, prior to commencement of the work of this Section.
- .3 Clean brick masonry units as work progresses.

### **2.3 CLEANING**

- .1 Follow procedures for cleaning in accordance with Section 04 05 10.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 2.1 Materials
- .6 2.2 Source Quality Control
- .7 3.1 Preparation
- .8 3.2 Masonry Procedures

### **1.3 SUMMARY**

- .1 Concrete masonry units:
  - .1 Normal weight units.
  - .2 Ultra light weight units.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 04 05 00 – Masonry Procedures.

## **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 Solid concrete masonry units may be used where grouted block is indicated on the Shop Drawings, whenever reinforcing is not indicated, in lieu of grouted solid installation method.
  - .4 Size: metric.
- .3 Normal weight units:
  - .1 Hollow units: H/15/A/M, H/20/A/M, and H/30/A/M.
  - .2 Semi-solid units: SS/15/A/M, SS/20/A/M, and SS/30/A/M.

- .3 Full solid units: SF/15/A/M, SF/20/A/M, and SF/30/A/M.
- .4 Colour: grey.
- .5 Profiles: as indicated on the Shop Drawings.
- .4 Ultra light weight units:
  - .1 Hollow units: H/15/D/M.
  - .2 Semi-solid units: SS/15/D/M.
  - .3 Full solid units: SF/15/D/M.
  - .4 Colour: grey.
  - .5 Profiles: as indicated on the Shop Drawings.
  - .6 Acceptable *Products*:
    - .1 Richvale Block 'Ultra Lite'
    - .2 Permacon 'Super Lightweight'.
    - .3 Or *Equivalent*.

## **2.2 SOURCE QUALITY CONTROL**

- .1 Perform tests on masonry units to determine compressive strength as required by the *Authorities Having Jurisdiction* 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 Section 04 05 00 – Masonry Procedures and CAN/CSA A371-04, as accepted by the Consultant in mock-up sample wall.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 Hot-dip galvanizing of iron and steel materials.

### **1.3 RELATED WORK**

- .1 Steel materials, fabrications and assemblies are specified to be furnished and installed in various other sections including, but not limited to:

- .1 05 50 00 - Metal Fabrications

### **1.4 REFERENCES**

- .1 Publications

- .1 American Galvanizers Association (AGA):

- .1 [Inspection of Hot-Dip Galvanized Steel Products](#)
    - .2 [Design of Products to be Hot-Dip Galvanized After Fabrication](#)
    - .3 [Hot-Dip Galvanized Architecturally Exposed Structural Steel Guide](#)
    - .4 [Hot-Dip Galvanized Steel Bridges: A Practical Design Guide](#)
    - .5 [Recommended Details for Galvanizing Structures](#)
    - .6 [Hot-Dip Galvanizing for Corrosion Protection: A Specifier's Guide](#)
    - .7 [Hot-Dip Galvanized Reinforcing Steel: A Specifier's Guide](#)
    - .8 [Preparing Hot-Dip Galvanized Steel For Paint](#)
    - .9 [Preparing Hot-Dip Galvanized Steel For Powder Coating](#)
    - .10 [Wet Storage Stain](#)
    - .11 [Hot-Dip Galvanized Coating Appearance](#)

- .2 Research Council on Structural Connections:

- .1 [Specification for Structural Joints Using High-Strength Bolts](#)

- .2 Reference standards

- .1 American Society for Testing and Materials (ASTM):
  - .2 A123/A123M, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - .3 A143/A143M, Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
  - .4 A153/A153M, Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - .5 A384/A384M, Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies

- .6 A385/A385M, Providing High-Quality Zinc Coatings (Hot-Dip)
- .7 A767/A767M, Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
- .8 A780/A780M, [Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings](#)
- .9 B6, Specification for Zinc
- .10 D6386, Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
- .11 E376, Measuring Coating Thickness by Magnetic-Field or Eddy Current (Electromagnetic) Testing Methods

## 1.5 QUALITY ASSURANCE

- .1 Coating Applicator: The Galvanizer shall maintain a quality management system that addresses the following items. The extent of documentation and self-audit method for effectiveness is determined by the Galvanizer:
  - .1 Management
  - .2 Galvanizing Order Review
  - .3 Purchasing
  - .4 Material Identification
  - .5 Galvanizing Process Control
  - .6 Inspection
  - .7 Calibration
  - .8 Addressing Nonconformances
  - .9 Corrective Actions
  - .10 Handling & Delivery
  - .11 Training Qualifications of Personnel
  - .12 Internal Audit
- .2 Pre-construction Conference for Metal Fabrications: Contractor shall schedule a meeting to be attended by contractor, architect/engineer, fabricator and galvanizer. Topics to be addressed include project schedule, scope of metal fabrications, coordination between fabricator and galvanizer, finish of surfaces, application of coatings, submittals, and approvals.
- .3 Coordination Between Fabricator and Galvanizer: Prior to fabrication, fabricators shall submit approved fabrication shop drawings to the galvanizer. The Galvanizer shall review fabricator's shop drawings for suitability of materials for galvanizing and coatings and coordinate any required fabrication modifications.
- .4 Materials: For steel to be hot-dip galvanized, provide steel chemically suitable for metal coatings complying with the following requirements:
  - .1 carbon below 0.25%,
  - .2 phosphorous below 0.04%,



- .3 manganese below 1.3%, and
- .4 silicon below 0.04% or between 0.15% and 0.22%.
- .5 Notify the galvanizer if steel does not meet these requirements so that suitability for galvanizing may be determined and whether special processing techniques are required.

## 1.6 SUBMITTALS

- .1 In accordance with provisions of Section [01400] [01430], submit an original and two copies of the coating applicator's notarized Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements of ASTM A123/A123M, A153/A153M, or A767/A767M, as applicable.

## 1.7 DELIVERY, STORAGE & HANDLING

- .1 Store and protect products under the provisions of Section [01600] [01620].
- .2 Load and store galvanized articles in accordance with accepted industry standards and [AGA Publication Wet Storage Stain](#).

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE COATING APPLICATORS

- .1 Members of the AGA or equal approved by the architect and/or engineer. A list of American Galvanizers Association members is available from the [Galvanizer Locator](#).

### 2.2 STEEL MATERIALS

- .1 Material for galvanizing to be geometrically suitable for galvanizing as described in ASTM A384/A384M and A385/A385M. Steel materials suitable for galvanizing include structural shapes, pipe, tube, castings, strip, bar, sheet, fabrications and assemblies.
- .2 Material to be chemically suitable for galvanizing.
  - .1 Steels containing carbon below 0.25%, phosphorus below 0.04% and manganese below 1.3%, either individually or in combination, and providing the silicon content is less than 0.04% or between 0.15% and 0.22%, will normally develop a typical coating when conventional galvanizing techniques are applied.
  - .2 In cases where steel is selected for considerations other than galvanizing and the chemistry of the elements (C, Mn, P, and Si) are beyond the recommendations indicated above, the steel can often be galvanized but is more likely exhibit atypical characteristics such a rough texture or matte gray color.
- .3 Recommended steel materials for hot-dip galvanizing include but are not limited to:
  - .1 Structural shapes and plates: ASTM A36/A36M, A242/A242M type 2, A283/A283M, A500/A500M, A501/A501M, A529/A529M, A572/A572M, A588/A588M, A709/A709M, and A992/A992M.
  - .2 Steel for fasteners:

General Category	Bolt Material	Nut Material
Carbon Steel	A307 Gr A & B	A563/A563M Gr A
High-strength	F3125/F3125M Gr A325/A325M	A563/A563M Gr DH
Tower Bolts	A394	A563/A563M Gr A

Quenched & Tempered (Carbon Steel Bolts)	A499	A563/A563M Gr C
Quenched & Tempered (Alloy Steel Bolts)	A354 Gr BC	A563/A563M Gr DH

- .3 Steel for sheet metal articles: ASTM A1011/A1011M or A1018/A1018M.
- .4 Steel for pipe or tubing: ASTM A53/A53M, or A595/A595M Gr A or B.
- .5 The requirements for malleable iron castings to be galvanized shall be as stated in Specification A47/A47M.

## 2.3 FABRICATION REQUIREMENTS

- .1 Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA's [Recommended Details for Galvanized Structures](#).
- .2 The design and fabrication of the product to be galvanized are the responsibilities of the designer and the fabricator. Practices ASTM A385/A385M provides guidance for steel fabrication for optimum hot dip galvanizing and shall be complied with in both design and fabrication.
- .3 *Consultation between the designer, fabricator, and galvanizer at appropriate stages in the design and fabrication process will reduce future problems.*
- .4 Safeguard products against steel embrittlement in conformance with ASTM A143/A143M. Avoid fabrication techniques that could cause steel embrittlement.
- .5 Safeguard products against distortion in conformance with ASTM A384/A384M. Avoid fabrication techniques that could cause steel distortion.
- .6 The fabricator shall consult with architect/engineer and hot-dip galvanizer regarding potential concerns, including handling issues, during the galvanizing process that may require design modification before fabrication proceeds.
- .7 Remove all welding slag, splatter, anti-splatter compounds and burrs prior to delivery for galvanizing.
- .8 Provide holes and/or lifting lugs to allow for handling during galvanizing.
- .9 Avoid unsuitable marking paints. Temporary markings should be made using a water-based or alcohol-based paint marking. Consult with the galvanizer about removal of grease, oil, paint and other deleterious material prior to fabrication.
- .10 Avoid unsuitable welding anti-splatter sprays containing silicone. If needed, water soluble and some solvent-based sprays should be used. Consult with the galvanizer about recommended welding spray products that will be fully removed prior to galvanizing.
- .11 Remove by blast-cleaning, or other methods, surface contaminants and coatings that are not removable by the normal chemical cleaning process in the galvanizing operation.

## PART 3 - EXECUTION

### 3.1 SURFACE PREPARATION

- .1 The galvanizer's pretreatment process removes organic contaminants (grease, dirt, and oil), rust, and mill scale meaning the following materials shall be removed prior to arrival at the galvanizing facility as they are unable to be sufficiently cleaned by the galvanizing pretreatment process:
  - .1 Weld slag and other welding flux residues

- .2 Weld splatter and anti-splatter
  - .3 Burrs (could include excessively rough edges from flame cutting)
  - .4 Very heavy or extremely adherent mill scale
  - .5 Mill coatings such as varnishes or lacquers present on some types of pipe
  - .6 Epoxies, types of vinyl, and asphalt
  - .7 Sand and other impurities on castings
  - .8 Oil-based paints and markers
  - .9 Crayon markers
  - .10 Very heavy or thick deposits of wax or grease
- .2 The selection of masking materials and responsibilities for masking material application are the responsibility of the fabricator.

### 3.2 COATING APPLICATION

- .1 Galvanize steel members, fabrications and assemblies after fabrication by the hot-dip process in accordance with ASTM A123/A123M.
- .2 Galvanize bolts, nuts, washers and iron and steel hardware components in accordance with ASTM A153/A153M.
- .3 Safeguard products against steel embrittlement in conformance with ASTM A143/A143M.
- .4 Safeguard products against distortion in conformance with ASTM A384/A384M.
- .5 Galvanize individual reinforcing steel bars in accordance with ASTM A767/A767M.
- .6 Handle all articles to be galvanized in such a manner as to avoid any mechanical damage and to minimize distortion.

### 3.3 COATING REQUIREMENTS

- .1 Coating Thickness: Conform to paragraph 6.1 of ASTM A123/A123M, Table 1 of ASTM A153/A153M, or Table 2 of A767/A767M, as appropriate.
- .2 Surface Finish: Confirm to paragraph 6.2 of ASTM A123/A123M.
- .3 Threaded Components in Assemblies: Conform to paragraph 6.3 of ASTM A123/A123M.
- .4 Appearance: Conform to paragraph 6.4 of ASTM A123/A123M.
- .5 Adhesion: Confirm to paragraph 6.5 of ASTM A123/A123M.

### 3.4 TESTS

- .1 Inspection and testing of hot-dip galvanized coatings should be done under the guidelines provided in the AGA publication [\*Inspection of Hot-dip Galvanized Steel Products\*](#).
- .2 Inspection for coating thickness shall be performed by magnetic thickness measurements in accordance with ASTM A123/A123 paragraph 8.2.1 and according to the sampling plan described in paragraph 7.

- .3 Include visual examination in accordance with ASTM A123/A123M, A153/A153M, or A767/A767M, as applicable, to determine conformance of the requirements for surface finish and appearance.
- .4 Testing for adhesion shall not be required unless strong evidence of adhesion concerns are suspected such as peeling or flaking of the galvanized coating. Testing for adherence shall be conducted in accordance with ASTM A123/A123 paragraph 8.3.
- .5 Testing for embrittlement shall not be required unless strong evidence of embrittlement is present. Testing for embrittlement shall be conducted in accordance with ASTM A123/A123 paragraph 8.4.
- .6 Furnish notarized Certificate of Compliance with ASTM standards and specifications herein listed. The Certificate must be signed by the galvanizer and contain a detailed description of the material processed. The Certificate shall include information as to the ASTM standard used for the coating.

### **3.5 REPAIR OF DAMAGED COATING**

- .1 The maximum area to be repaired at the galvanizing facility shall be in accordance with ASTM A123/A123M, Section 6.2.
- .2 Once the parts have left the galvanizing facility there shall be no limit on the size of the area subject to renovation.
- .3 Repair areas damaged by welding, flame cutting or during handling, transport or erection by one of the approved methods in accordance with ASTM A780/A780M whenever damage exceeds 4.5mm in width. Minimum thickness requirements for the repair are those described in ASTM A123/A123M, Section 6.2.

**END OF SECTION**

#### APPENDIX 1: ADDITIONAL REFERENCES & STANDARDS

- .1 American Association of State Highway and Transportation Officials (AASHTO):
- .2 M 30, Metallic-Coated Steel Wire Rope and Fittings for Highway Guardrail
- .3 M 111M/M 111, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- .4 M 120, Specification for Zinc
- .5 M 164, High-Strength Bolts for Structural Steel Joints
- .6 M 167M/M 167, Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
- .7 M 180, Corrugated Sheet Steel Beams for Highway Guardrail
- .8 M 181, Chain-Link Fence; Standard Specification
- .9 American Society for Testing and Materials (ASTM):
  - .1 A53/A53M, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - .2 A90/A90M, Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
  - .3 A307, Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
  - .4 F3125/F3125M, High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength
  - .5 A390, Zinc-Coated (Galvanized) Steel Poultry Fence Fabric (Hexagonal and Straight Line)
  - .6 A392, Zinc-Coated Steel Chain-Link Fence Fabric
  - .7 A394, Steel Transmission Tower Bolts, Zinc-Coated and Bare
  - .8 A449, Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
  - .9 A563/A563M, Carbon and Alloy Steel Nuts (Inch and Metric)
  - .10 A595/A595M, Steel Tubes, Low-Carbon or High-Strength Low-Alloy, Tapered for Structural Use
  - .11 A702, Steel Fence Posts, Hot Wrought
  - .12 A740, Hardware Cloth (Woven or Welded Galvanized Steel Wire Fabric)
  - .13 A741, Metallic-Coated Steel Wire Rope and Fittings for Highway Guardrail
  - .14 A896, Conducting Case Studies on Galvanized Structures
  - .15 A992/A992M, Structural Steel Shapes
  - .16 B6, Specification for Zinc
  - .17 D6386, Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

- .18 E376, Measuring Coating Thickness by Magnetic-Field or Eddy Current (Electromagnetic) Testing Methods
- .19 F626, Fence Fittings
- .20 American Welding Society (AWS):
- .21 Publication entitled *Welding Zinc-Coated Steel*

## PART 1 – GENERAL

### 1.1 General Requirements

- .1 When members are specifically designated as “Architecturally Exposed Structural Steel” or “AESS” in the Contract Documents, the requirements in this section shall apply in addition to Section 05 21 19.
- .2 AESS members or components shall be fabricated and erected with the care and dimensional tolerances that are stipulated in this section.
- .3 Refer to Structural Drawings for “Key Plan” showing locations and Categories of AESS finishes. All AESS members must also be identified by their Category on the Architectural Design Documents.

### 1.2 Definition Categories

- .1 Categories are listed in the AESS Matrix shown in Table 1 where each Category is represented by a set of Characteristics. Refer to the CISC Code of Standard Practice Appendix I for additional information. The following Categories shall be used when referring to AESS:

**AESS 1: Basic Elements**

Suitable for “basic” elements which require enhanced workmanship.

**AESS 2: Feature Elements viewed at a Distance > 6 m**

Suitable for “feature” elements viewed at a distance greater than six meters. The process involves basically good fabrication practices with enhanced treatment of weld, connection and fabrication detail, tolerances for gaps, copes.

**AESS 3: Feature Elements viewed at a Distance  $\leq$  6 m**

Suitable for “feature” elements – where the designer is comfortable allowing the viewer to see the art of metalworking – welds are generally smooth but visible, some grind marks are acceptable. Tolerances are tighter than normal standards. The structure is normally viewed closer than six meters and is frequently subject to touch by the public.

**AESS 4: Showcase Elements**

Suitable for “showcase or dominant” elements – used where the designer is comfortable allowing the viewer to see the art of metalworking – welds are generally smooth but visible, some grind marks are acceptable. Tolerances are tighter than normal standards. The structure is normally viewed closer than six meters and is frequently subject to touch by the public.

**AESS C: Custom Elements**

Suitable for elements that require a different set of characteristics as specified in Categories AESS 1, 2, 3 or 4.

### **1.3 Related Documents**

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 “Specifications” Section, apply to this section.
- .2 Related Sections: The following section contain requirements that may relate to this section:
  - .1 Division 1 “Quality Control” Section for independent testing agency procedures and administrative requirements.
  - .2 Division 5 “Steel Joist” Section.
  - .3 Division 5 “Metal Decking” Section for erection requirements relating to exposed steel decking and its connections.
  - .4 Division 9 “Painting” Section for finish coat requirements and coordination with primer and surface preparation specified in this section.

### **1.4 Reference Standards**

- .1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.
- .2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code
- .3 Refer to and comply with all standards referred to in Section 05 21 19 of this specification, and in addition conform to the following:
  - .1 ASTM A6/A6M..... Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
  - .2 ASTM A780/A780M..... Standard Practice for Repair of Damaged and Uncoated areas of Hot-Dip Galvanized Coatings.

### **1.5 Submittals**

- .1 Submit each item below according to the Conditions of the Contract and Division 1 “Specifications” Section.



- .2 Shop Drawings detailing fabrication of AESS components:
  - .1 Provide erection drawings clearly indicating which members are considered as AESS members and identify by the Categories listed in Table 1.
  - .2 Include details that clearly identify all of the requirements listed in Sections 2.3 “Fabrication” and 3.3 “Erection” of this specification. Provide connections for AESS consistent with concepts, if shown on the Structural Design Documents.
  - .3 Indicate welds by standard CWB symbols, distinguishing between shop and field welds, and show size, length and type of each weld. Identify grinding, finish and profile of welds as defined herein.
  - .4 Indicate type, finish of bolts. Indicate which side of the connection bolt heads should be placed.
  - .5 Indicate any special tolerances and erection requirements;
  - .6 For Category AESS C, the AESS Matrix included in Table 1 shall be used to specify the required treatment of the element.
  - .7 Any variations from the AESS Categories listed must be clearly noted. These variations could include machined surfaces, locally abraded surfaces, and forgings. In addition:
    - .1 If distinction is to be made between different surfaces or parts of members the transition line/plane must be clearly identified/defined on the Shop detail, arrangement and erection drawings.
    - .2 Track welds, temporary braces, fixtures used in fabrication are to be indicated on shop drawings.
    - .3 All architecturally sensitive connection details will be submitted for approval by the Architect/Engineer prior to completion of shop detail drawings.

## 1.6 Quality Assurance

- .1 **FABRICATOR QUALIFICATIONS:** In addition to those qualifications listed in other sections of Division 5 “Structural Steel and Open Web Steel Joist Framing” Section 05 21 19, engage a firm with a minimum 5 years of experience in fabricating AESS similar to that indicated for this Project and with sufficient production capacity to fabricate the AESS elements.
- .2 **ERECTOR QUALIFICATIONS:** In addition to those qualifications listed in other sections of Division 5 “Structural Steel and Open Web Steel Joist Framing” Section 05 21 19, engage a competent Erector who has a minimum 5 years of experience carrying out comparable AESS work.

- .3 Comply with applicable provisions of the following specifications and documents:
  - .1 CISC Code of Standard Practice, latest edition.
- .4 Visual samples when specified may include any of the following:
  - .1 3-D rendering of specified element.
  - .2 Physical sample of surface preparation and welds.
  - .3 First off inspection: First element fabricated for use in finished structure subject to alterations for subsequent pieces.
  - .4 Mockups: As specified in Structural Design Document. Mockups are either scaled or full scale. Mockups are to demonstrate aesthetic effects as well as qualities of materials and execution:
    - .1 Mockups may have finished surface (including surface preparation and paint system).
    - .2 Architect's approval of mockups is required before starting fabrication of final units.
    - .3 Mockups are retained until project is completed.
    - .4 Approved full-scale mockups may become part of the completed work.

## **1.7 Delivery, Storage and Handling**

- .1 Ensure that all items are properly prepared, handled and/or package for storage and shipping to prevent damage to product.
- .2 Erect finished pieces using softened slings or other methods such that they are not damaged. Provide padding as required to protect while rigging and aligning member's frames. Weld tabs for temporary bracing and safety cabling only at points concealed from view in the completed structure or where approved by the Architect.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

- .1 General: Meet requirements of sections of Division 5 "Structural Steel and Open Web Steel Joist Framing" Section 05 21 19.
- .2 Specialty bolts must be specified.

## **2.2 Special Surface Preparation**

- .1 Primers: Primers must be specified.

## **2.3 Fabrication**

### **.1 GENERAL FABRICATION**

- .1 For the special fabrication characteristics, see Table 1 – AESS Category Matrix.
- .2 Fabricate and assemble AESS in the shop to the greatest extent possible. Locate field joints in AESS assemblies at concealed locations or as approved by the Architect.
- .3 Fabricate AESS with surface quality consistent with the AESS Category and visual samples if applicable.
- .4 The fabricator is to take special care in handling the steel to avoid marking or distorting the members, as follows:
  - .1 All slings will be nylon type or chains with softeners or wire rope with softeners.
  - .2 Care is also taken to minimized damage to any shop paint or coating.
  - .3 If temporary braces or fixtures are required during fabrication, during shipment, or to facilitate erection, care must be taken to avoid and/or repair any blemishes or unsightly surfaces resulting from the use or removal of such temporary elements.
  - .4 Tack welds are ground smooth.
- .2 UNFINISHED, REUSED OR WEATHERING STEEL: Members fabricated of unfinished, reused or weathering steel that are to be AESS may still have erection marks, painted marks or other marks on surfaces in the completed structure. Special requirements shall be specified as Category AESS C.
- .3 TOLERANCES FOR ROLLED SHAPES: The permissible tolerances for depth, width, and out of square, camber and sweep of rolled shapes shall be as specified in CSA G40.20/21 and ASTM A6. The following exceptions apply:
  - .1 For Categories AESS 3 and 4 and otherwise specified in the Contract Documents: The matching of abutting cross-sections shall be required.
  - .2 For Categories AESS 2, 3 and 4: The as-fabricated straightness tolerance of a member is one-half of the standard camber and sweep tolerance in CSA G40.20/21.

- .4 TOLERANCES FOR BUILT-UP MEMBERS: The tolerance on overall profile dimensions of members made up from a series of plates, bars and shapes by welding is limited to the accumulation of permissible tolerances of the component parts as provided by CSA W59 and ASTM A6. For Categories AESS 2 and 3, use camber and sweep tolerances in CSA W59.
- .5 JOINTS: For Categories AESS 3 and 4, all copes, miters and butt cuts in surfaces exposed to view are made with uniform gaps, if shown to be open joint, or in uniform contact if shown without gap.
- .6 SURFACE APPEARANCE: For Categories AESS 1, 2 and 3, the quality surface as delivered by the mills should be acceptable. For Category AESS 4, the steel surface imperfections should be filled and sanded.

## **2.4 Shop Connections**

- .1 BOLTED CONNECTIONS: Make in accordance with Section 05 21 19. Provide bolt type and finish as specified and place bolt heads as indicated on the approved shop drawings.
- .2 WELDED CONNECTIONS:
  - .1 Comply with CSA W59 and Section 05 21 19. Appearance and quality of welds shall be consistent with the Category and visual samples if applicable. Assemblies and weld built-up sections by methods that will maintain alignment of members to the tolerance of this section.
  - .2 For corrosive environments, all joints should be seal welded. In addition:
    - .1 For Categories AESS 1, 2 and 3, a smooth uniform weld will be acceptable. For AESS Category, the weld will be contoured and blended.
    - .2 For Categories AESS 1, 2, 3 and 4, all weld spatter is to be avoided/removed where exposed to view.
    - .3 For Categories AESS 1 and 2, weld projection up to 2 mm is acceptable for butt and plug welded joints. For Categories AESS 3 and 4, welds will be ground smooth/filled.
  - .3 WELD SHOW-THROUGH: It is recognized that the degree of weld show-through, which is any visual indication of the presence of a weld or welds on the opposite surface from the viewer, is a function of weld size and material thickness.

## **PART 3 – EXECUTION**

### **3.1 Examination**

- .1 The erector shall check all AESS members upon delivery for twist, kinks, gouges or other imperfections, which might result in rejection of the appearance of the member. Coordinate remedial action with fabricator prior to erecting steel.
- .2 STANDARD OF ACCEPTANCE: The standard for acceptance of delivered and erected member shall be equivalent to the standard employed at fabrication.

### **3.2 Preparation**

- .1 Provide connections for temporary shoring, bracing and supports only where noted on the approved shop erection drawings. Temporary connections shown shall be made at locations not exposed to view in the final structure or as approved by the Architect. Handle, lift and align pieces using padded slings and/or other protection required to maintain the appearance of the AESS through the process of erection.

### **3.3 Erection**

- .1 Set AESS accurately in locations and to elevations indicated, and according to CSA S16.
- .2 The Erector must plan and execute all operations in such a manner that allows the architectural appearance of the structure to be maintained.
- .3 In addition to the special care used to handle and erect AESS, employ the proper erection techniques to meet the requirements of the specified AESS Category:
  - .1 AESS Erection tolerances: Erection tolerances shall meet the requirements of standard frame tolerance for structural steel per CSA S16.
  - .2 All slings will be nylon strap or chains with softeners.
  - .3 If temporary braces or fixtures are required to facilitate erection, care must be taken to avoid and/or repair any blemishes or unsightly surfaces resulting from the use removal of such temporary elements.
  - .4 Removal of field connection aids: Run-out tabs, erection bolts and other steel members added to connections to allow for alignment, fit-up and welding in the field shall be removed from the structure. Welds at run-out tabs shall be removed to match adjacent surfaces and ground smooth. Holes for erection bolts shall be plug welded and ground smooth where specified. All backing bars will be removed and ground smooth.
  - .5 Filling of connection access holes: Filling shall be executed with proper procedures to match architectural profile, where specified.

- .6 Bolt Head Replacement: All bolt heads shall be placed as indicated on the structural design document. Where not noted, the bolt heads in a given connection shall be on the same side, as specified, and consistent from one connection to another.
- .7 Field Welding: Weld profile, quality, and finish shall be consistent with Category and visual samples, if applicable, approved prior to fabrication.
- .8 Tack welds shall be ground smooth and holes shall be filled with weld metal or body filler and smoothed by grinding or filling to the standards applicable to the shop fabrication of the materials.

### **3.4 Erection Tolerances**

- .1 Unless otherwise specified in the Contract Documents, members and components are plumbed, leveled and aligned to a tolerance equal to the tolerance permitted for structural steel.

### **3.5 Field Connections**

- .1 BOLTED CONNECTIONS: Make in accordance with Section 05 21 19. Provide bolt type and finish as specified and place bolt heads as indicated on the approved shop drawings.
- .2 WELDED CONNECTIONS:
  - .1 Comply with CSA W59 and Section 05 21 19. Appearance and quality of welds shall be consistent with the Category and visual samples if applicable. Assemble and weld built-up sections by methods that will maintain alignment of members to the tolerance of this section.
  - .2 Assemble and weld built-up sections by methods that will maintain alignment of axes. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.

### **3.6 Adjustable Connections**

- .1 Specifically designated more stringent erection tolerances for AESS require that the Owner's plans specify/allow adjustable connections between AESS adjoining structural elements, in order to provide the Erector with means for adjustment and/or specify the method to be used to achieve the desired dimensions. Any proposed adjustment details desired by the Erector shall be submitted to the Architect and Engineer for review.

### **3.7 Architectural Review**

- .1 The Architect shall review the AESS steel in place and determine acceptability based on the Category and visual samples (if applicable). The Fabricator/Erector will advise the consultant of the schedule of the AESS Work.

### 3.8 Protection

- .1 In addition to requirements of Division 5 "Structural Steel and Open Web Steel Joist Framing" Section 05 21 19, protect AECS steel in accordance with table below.

Environment	Structural Member	Preparation	Protection	Remarks
Protected (Inside vapour barrier)	Structural Steel and Joists	SSPC-SP6 Commercial Blast Cleaning	CISC/CPMA 2-75	
Unprotected (outside vapour barrier) but <b>not</b> exposed to chlorides.	Structural Steel and joists	SSPC-SP6 Commercial Blast Cleaning	Inorganic zinc-rich primer (SSPC Paint 20, type I) and epoxy paint (SSPC Paint 22)	Provide topcoat SSPC Paint 36, Level 3, when exposed to sunlight
Unprotected (outside vapour barrier) exposed to chlorides.	Structural Steel and Joists	SSPC-SP10 Near White Blast Cleaning	Inorganic zinc-rich primer (SSPC Paint 20, type I) and epoxy paint (SSPC Paint 22)	Provide topcoat SSPC Paint 36, Level 3, when exposed to sunlight

Notes:

- (a) Submit proposed coating system for approval of consultant prior to application.

### 3.9 Adjusting and Cleaning

- .1 Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint shall be completed to blend with the adjacent surfaces of AECS. Such touch up work shall be done in accordance with manufacturer's instructions.
- .2 Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

### 3.10 Quality Control

- .1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.
- .2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.
- .3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Consultants of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility. The contractor is solely responsible for quality control and shall implement its own supervisory and quality control procedures.

### **3.11 Notification**

- .1 Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

### **3.12 Inspection and Testing**

- .1 The General Contractor in agreement with the Prime Consultant will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.
- .2 The Inspection and Testing Company will conduct inspection and testing services per the following:
  - .1 Specification Section 01 45 23 – *Testing and Inspection Services – General Requirements.*

### **3.13 Defective Materials and Work**

- .1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.
- .2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.
- .3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.



**Table 1 – AESS Category Matrix**  
See Notes corresponding to Id (Next Page)

	Category	AESS C	AESS 4	AESS 3	AESS 2	AESS 1	SSS
Id	Characteristics	Custom Elements	Showcase Elements	Feature Elements (Viewed at a Distance $\leq 6$ m)	Feature Elements (Viewed at a Distance $> 6$ m)	Basic Elements	Standard Structural Steel (CSA S16)
1.1	Surface preparation to SSPC-SP 6		X	X	X	X	
1.2	Sharp edges ground smooth		X	X	X	X	
1.3	Continuous weld appearance		X	X	X	X	
1.4	Standard structural bolts		X	X	X	X	
1.5	Weld spatters removed		X	X	X	X	
2.1	Visual Samples		Optional	Optional	Optional		
2.2	One-half standard fabrication tolerances		X	X	X		
2.3	Fabrication marks not apparent		X	X	X		
2.4	Welds uniform and smooth		X	X	X		
3.1	Mill marks removed		X	X			
3.2	Butt and plug welds ground smooth and filled		X	X			
3.3	HSS weld seam oriented for reduced visibility		X	X			
3.4	Cross sectional abutting surface aligned		X	X			
3.5	Joint gap tolerances minimized		X	X			
3.6	All welded connections		Optional	Optional			
4.1	HSS seam not apparent		X				
4.2	Welds contoured and blended		X				
4.3	Surfaces filled and sanded		X				
4.4	Weld show-through minimized		X				
C.1			X				
C.2			X				
C.3			X				
C.4			X				

### Notes to Table 1

- 1.1 Prior to blast cleaning, any deposits of grease or oil are to be removed by solvent cleaning, SSPC-SP 1.
- 1.2 Rough surfaces are to be deburred and ground smooth. Sharp edges resulting from flame cutting, grinding and especially shearing are to be softened.
- 1.3 Intermittent welds are made continuous, either with additional welding, caulking or body filler. For corrosive environments, all joints should be seal welded. Seams of hollow structural sections shall be acceptable as produced.
- 1.4 All bolt heads in connections shall be on the same side, as specified, and consistent from one connection to another.
- 1.5 Weld spatter, slivers, surface discontinuities are to be removed. Weld projection up to 2 mm [1/16"] is acceptable for butt and plug welded joints.
- 2.1 Visual samples are either a 3-D rendering, a physical sample, a first off inspection, a scaled mock-up or a full-scale mock-up, as specified in Contract Documents.
- 2.2 These tolerances are required to be one-half of those of standard structural steel as specified in CSA S16.
- 2.3 Members marked with specific numbers during the fabrication and erection processes are not to be visible.
- 2.4 The welds should be uniform and smooth indicating a higher level of quality control in the welding process.
- 3.1 All mill marks are not to be visible in the finished product.
- 3.2 Caulking or body filler is acceptable.
- 3.3 Seams shall be oriented away from view or as indicated in the Contract Documents.
- 3.4 The matching of abutting cross-sections shall be required.
- 3.5 This characteristic is similar to 2.2 above. A clear distance between abutting members of 3 mm [1/8"] is required.
- 3.6 Hidden bolts may be considered.
- 4.1 HSS seams shall be treated so they are not apparent.
- 4.2 In addition to a contoured and blended appearance, welded transitions between members are also required to be contoured and blended.
- 4.3 The steel surface imperfections should be filled and sanded.
- 4.4 The back face of the welded element caused by the welding process can be minimized by hand grinding the backside of the weld. The degree of weld-through is a function of weld size and material.
- C. Additional characteristics may be added for custom elements.

END OF SECTION 05 12 13

## PART 1 – GENERAL

### 1.1 General Requirements

- .1 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

### 1.2 Reference Standards

- .1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.
- .2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code.
- .3 Conform to the following CSA Standards:
  - .1 S16..... Design of Steel Structures.
  - .2 W59..... Welded Steel Construction (Metal Arc Welding).
  - .3 W47.1..... Certification of Companies for Fusion Welding of Steel.
  - .4 G40.20/G40.21..... General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 S136..... North American Specification for the Design of Cold-Formed Steel Structural Members.
- .4 Conform to the following ASTM Standards:
  - .1 A108..... Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
  - .2 A123/A123M ..... Standard Specification for Zinc (Hot-Dip Galvanized) Coatings for Iron and Steel Products.
  - .3 A563..... Standard Specification for Carbon and Alloy Steel Nuts.

- .4 F436/436M ..... Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
- .5 F1554 ..... Standard Specification for Anchor Bolts, Steel, 36, 44 and 105 ksi Yield Strength.
- .6 F3125/F3125M ..... Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- .5 Conform to:
  - .1 CISC/CPMA 1-73a ..... A Quick-Drying One-Coat Paint for Use on Structural Steel.
  - .2 CISC/CPMA 2-75 ..... A Quick-Drying Primer for Use on Structural Steel.
- .6 In the event of conflict between reference standards, codes, drawings and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally the more stringent provision shall govern. No extras to the contract will be approved due to such clarification.
- .7 Conform to the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, latest amendment.

### 1.3 Architectural Exposed Structural Steel (AESS)

- .1 Where finished surfaces of steel are designated as AESS on the drawings, refer to Section 05 12 13 "Architecturally Exposed Structural Steel" for additional requirements.

### 1.4 Source Quality Assurance

- .1 The following is MANDATORY;
  - .1 The bidding Contractors are advised that their bids may be rejected unless documentation is submitted.
  - .2 Submission does not mean acceptance. Acceptance shall be in writing issued by the Consultant.

- .3 The steel fabricator and erector shall have a minimum of five (5) years of experience on projects of similar size and scope. If requested, the fabricator and erector shall provide documentation with references including contact names and phone numbers.
- .2 Submit two (2) certified copies of mill reports covering chemical and physical properties of steel used in this work.

## 1.5 Design of Details and Connections

- .1 Design details, new connections and open web steel joists by a Licensed Professional Engineer, to requirements of CSA-S16 or CSA-S136 to resist forces, moments and shears indicated on or implied by the drawings.
- .2 Unless otherwise noted, beam connections shall be designed for a minimum of 50% of the shear capacity of the beam.
- .3 Conform to the Fire Rated Assembly Design specified for the project.
- .4 Bolts in the following types of connections are to be **pretensioned** in accordance with the requirements of S16:
  - .1 Slip-critical connections.
  - .2 Connections governed by seismic requirements.
  - .3 Connections for all elements resisting crane loads.
  - .4 Connections for members directly supporting running machines or other live loads that produce impact or cyclic load.
  - .5 Connections where bolts are subject to tensile loads.
  - .6 Connections using oversized or slotted holes unless specifically designed to accommodate moment.
- .5 The following types of connections are to be designed as **slip-critical connections**:
  - .1 Connections where slippage cannot be tolerated, including:
    - 1. All moment connections (unless end plate type moment connections are used).
    - 2. Connections where welds and bolts share in transmitting shear forces at a common faying surface.
  - .2 Connections that utilise oversized holes.
  - .3 Connections subject to fatigue or frequent load reversals.

.6 OPEN WEB STEEL JOISTS

- .1 Design steel joists and bridging to carry loads indicated or implied by the drawings in accordance with CSA-S16 or CSA-S136. In addition, design joints for any concentrated loads resulting from piping which runs parallel with the joists. Bottom chords shall be designed for a minimum point load of 2 kN at any location, except for bottom chords of joists directly above mechanical, electrical or equipment areas which shall be designed for a minimum point load of 4 kN at any location.
- .2 Design joists and anchorages for uplift forces as indicated.
- .3 Ensure joists are manufactured to consider load effects due to fabrication, erection and handling.
- .4 Limit roof joist deflection due to specified live load to 1/300 of span.
- .5 For joist spans adjacent to rigid supports (e.g. bearing walls, rigid beams or trusses, or intermediate columns), gradually increase the stiffness of the joists in the vicinity of the rigid support such that the differential live load deflection between adjacent joists spaced at a distance "S" is within 1/300 of 2\*S, for roof joists.
- .6 Joists which will be permanently exposed shall be neat and uniform in appearance to the approval of the Architect.

**1.6 Submissions**

- .1 Refer also to **Source Quality Assurance**.
- .2 Refer also to **Quality Control**.
- .3 Prior to submission of SHOP DRAWINGS, submit calculations and sketches for review that bear the stamp and signature of the Licensed Professional Engineer responsible for the design. The following are MANDATORY REQUIREMENTS:
  - .1 TYPICAL MOMENT CONNECTIONS.
  - .2 VERTICAL BRACINGS.
  - .3 COLUMN TO BASE PLATE CONNECTIONS.
  - .4 BEAM TO COLUMN SHEAR CONNECTIONS.
  - .5 BEAM TO BEAM CONNECTIONS.
  - .6 COLUMN TO COLUMN "VERTICAL" AND "FUTURE" CONNECTIONS.
  - .7 NON-STANDARD CONNECTIONS.
  - .8 OPEN WEB STEEL JOISTS.

- .4 Submitted Shop Drawings shall cross reference to reviewed and approved calculations and sketches.
- .5 **Shop Drawings**
  - .1 Provide erection drawings having a scale no less than the structural framing plans and detail drawings of individual members and complete information necessary for fabrication and erection.
  - .2 Copies of Structural Framing Plans and Sections utilized as erection drawings are not permitted unless permission is first sought from and granted by the Structural Consultant.
  - .3 Submit shop drawings for review as directed.
  - .4 All shop drawings shall bear a Professional Seal and Signature.
  - .5 OPEN WEB STEEL JOISTS:
    - .1 Provide layout drawings showing location of open web steel joists, and design calculations for joists, covering each case of joist total loading.
    - .2 Drawings and calculations must be prepared using **METRIC** units. If both imperial and metric units are shown, only metric units will be reviewed in context of the rubber stamp placed on each drawing.
    - .3 All steel joists shall be designed by a Professional Engineer experienced in this type of design and all drawings and calculations shall bear a Professional Seal and Signature.
    - .4 OWSJ shop drawings and calculations submitted for review and **NOT BEARING** the stamp of the Professional Engineer responsible for the OWSJ design, and **NOT ACCOMPANIED** by stamped calculations, will **NOT BE REVIEWED** and will be returned to the Contractor.
  - .6 Fabrication shall not commence until shop drawings are reviewed.
  - .7 Allow ten (10) working days for the review of drawings and supply as many copies for review and distribution as directed. Shop drawings shall be checked in detail by the Contractor and shall bear the checker's initials before submission.
  - .8 Drawings which fail to meet these requirements shall be returned marked **NOT REVIEWED** and must be re-submitted after correction.
  - .9 The review of shop drawings shall not relieve the Contractor of the responsibility of seeing that this work is complete, accurate and in conformity with the drawings and this specification.

- .10 Only shop drawings bearing the review stamps shall be kept at the site.

## PART 2 – PRODUCTS

### 2.1 Materials

#### .1 MATERIALS

- .1 Structural steel sections and plates and all connection angles and plates shall conform to CSA Standard G40.20/G40.21 as follows:

W shapes – Grade 350W.  
S shapes – Grade 300W.  
HSS Shapes – Grade 350W (Class C unless noted).  
Channels, Angles – Grade 350W.  
Plates and Rod – Grade 300W.

Note that ASTM A500 grade C HSS columns are NOT an acceptable direct substitution for CSA G40.21.

- .2 Welding materials: to conform to CSA Standard W59.
- .3 High Strength Fasteners: Bolts, Nuts, and Washers to conform to ASTM F3125/3125M, grade A325.
- .4 Anchor Rods: to conform to to ASTM F1554, Grade 36, unless otherwise noted on the drawings
- .5 Sag Rods: to conform to CSA G40.20/G40.21.
- .6 Strap Anchors: to conform to CSA G40.20/G40.21.
- .7 Shear Stud Connectors: to conform to ASTM A108,  $F_y = 345 \text{ MPa}$  [50 ksi].
- .8 PAINT:

- .1 General Steel: Shop Primer and Field “touch-up” Paint to conform to SSPC-PAINT 20 (Type I)
- .2 For exterior exposed steel where surfaces are to be primed provide a Corrosion Resistant and Field “touch-up” Primer as follows:

Acceptable product:

- .1 CARBOZINC 11, (Solvent based inorganic zinc)
- .2 Colour, 0300 (GREEN) or 0700 (GRAY)



- .3 Steel Surface Preparation:  
A minimum, non-immersion SSPC-SP6 and obtain a 25 to 75 micrometres [1 – 3 mils] Angular Blast Profile.
- .4 Dry Film Thickness:  
50 to 75 micrometres [2 – 3 mils] applied by spray (airless or conventional) with constant agitation.
- .5 Field Touch-Up:  
Areas less than 0.1 m<sup>2</sup> [1 ft<sup>2</sup>]: clean (SSPC SP-1) , manually abrade (SSPC SP-2 or SP-3) and touch-up with Carbozinc 859 (organic zinc, SSPC Paint 20, type II).  
Areas more than 0.1 m<sup>2</sup> [1 ft<sup>2</sup>]: Tape, re-blast to SSPC SP-6 and spray apply Carbozinc 11 (Inorganic Zinc, SSPC Paint 20, Type I).
- .3 Where an epoxy paint (SSPC Paint 20) is specified in combination with a zinc-rich primer, provide a compatible epoxy paint as follows:  
  
Acceptable product:
  - 1. CARBOGUARD 890 (Cycloaliphatic Amine Epoxy)
  - 2. Dry Film thickness: 100 to 150 micrometres [4.0-6.0 mils]
- .4 For field “touch-up” of galvanized surfaces provide same product as touch-up primer.
- .9 GALVANIZING: For connections at all members specified to be galvanized, provide galvanized nuts, bolts, washers, clip angles and plates etc.

## **PART 3 – EXECUTION**

### **3.1 Fabrication**

- .1 Fabricate structural steel and joists to CSA S16 and W59, and in accordance with reviewed shop drawings.
- .2 Provide drain holes in closed HSS Sections to prevent moisture build-up within the member.

### **3.2 Protection**

- .1 Refer to Section 05 12 13 “Architecturally Exposed Structural Steel” for protection requirements of Architecturally Exposed Structural Steel.

.2 Cleaning Steel

- .1 Clean structural steel and joists in accordance with the table below.
- .2 Clean surfaces within 50 mm (2") of any field weld location of materials which would prevent proper welding or produce objectionable fumes while welding is being completed.

.3 Painting

- .1 Shop paint or galvanize structural steel in accordance with the table below. Refer also **Galvanized Sections** for additional requirements.
- .2 Apply coating under cover, on dry surfaces only and when surface and air temperatures are above 5°C [41°F].
- .3 Maintain dry conditions and 5°C [41°F] minimum temperature until coating thoroughly dry.
- .4 Joints which are to be field welded shall be kept free of primer or other coating that could be detrimental to achieving sound weldment.
- .5 FIELD TOUCH-UP for welds, scrapes, etc.
  - .1 General Interior Surfaces: ..... With specified coating
  - .2 Exterior Exposed Surfaces:.... With specified coating
  - .3 Galvanized Surfaces:..... GALVAFROID or approved equal

Environment	Structural Member	Preparation	Protection	Remarks
Dry enviroment with structural steel encased in concrete, or masonry, or covered in non-corrosive contact type fire proofing	Structural Steel and joists	SSPC-SP3 Power Tool Cleaning	Leave Unpainted	
Protected (Inside vapour barrier)	Structural Steel not exposed to view	SSPC-SP3 Power Tool Cleaning	CISC/CPMA 1-73a	
	Joists not exposed to view	SSPC-SP2 Hand Tool Cleaning	CISC/CPMA 1-73a or SSPC Paint 15	
	Structural Steel or Joists exposed to view, but not designated as AESS	SSPC-SP7 Brush-Off Blast Cleaning	CISC/CPMA 2-75	.

Unprotected (outside vapour barrier and/or unconditioned space) but <b>not</b> exposed to chlorides. (See note (a))	Structural Steel	SSPC-SP7 Brush-Off Blast Cleaning + SSPC-SP8 Pickling	Hot Dip Galvanize	Note additional requirements for galvanizing in specification sections.
	Joists	SSPC-SP6 Commercial Blast Cleaning	Inorganic zinc-rich primer (SSPC Paint 20, type 1)	
Unprotected (outside vapour barrier and/or unconditioned space) exposed to chlorides.	Structural Steel	SSPC-SP10 Near White Blast Cleaning	Inorganic zinc-rich primer (SSPC Paint 20, type I) and epoxy paint (SSPC Paint 22)	Provide topcoat SSPC Paint 36, Level 3, when exposed to sunlight

Notes:

- (a) This includes canopies, outdoor screens, exterior mechanical support framing, shelf angles (including supporting brackets) and lintels in exterior walls.
- (b) Submit proposed coating system for approval of consultant prior to application.

### 3.3 Galvanized Sections

- .1 Apply galvanizing to all steel members as noted in clause 3.2.
- .2 Fabricate all framing prior to galvanizing providing all required vent holes and cap plates to ensure complete internal and external coverage is required.
- .3 Galvanize in accordance with A123/A123M to minimum coating of 610 g/m<sup>2</sup> [2 oz/ft<sup>2</sup>].
- .4 All bolts, nuts, washers, connector plates, clips, etc. at member connections shall be galvanized.
- .5 Galvanize members after shop welding has been completed.
- .6 When welding after galvanizing is in place, grind away galvanizing at areas to be welded and touch-up with two coats of coating complying with SSPC PAINT 20, type II.
- .7 In cases where galvanized framing is in contact with plain carbon steel locally provide two coats of coating to the plain steel complying with SSPC PAINT 32 where members are in contact.
- .8 Where the galvanizing process of members may cause distortion of the structural framing, submit procedures for review by the Consultant and make good to tolerances noted in the contract documents.
- .9 For joists, a 25 mm spacing between chord members is recommended. Provide larger spacing as required to suit the specified surface preparation.
- .10 Identify at time of tender any splices or additional fabrication requirements due to the size, length or weight constraints imposed by the galvanizing process.

.11 FINISH PAINTING

Where finish painting is specified for galvanized surfaces, the galvanizer is to eliminate any after-galvanizing treatment that would normally be applied to the coating that will adversely affect paint adhesion.

**3.4 Joist Bridging & Bottom Chord Roof Bracing**

- .1 All bridging, bracing and anchorages to be as required by the drawings and CSA S16.

**3.5 Joist Bearing Anchorage**

- .1 Conform to Specification, Typical Details and Notes on drawings unless specifically noted otherwise.
- .2 Joists bearing on steel shall be anchored with welds as shown on drawings and typical details. Welds shown are minimum.
- .3 Joists bearing on masonry shall be welded to Wall Plates as shown on drawings and typical details. Welds shown are minimum.
- .4 It is anticipated, in order to accommodate the roof slopes, (refer to Architectural Plans and Details) that it will be necessary to modify OWSJ shoes and/or to provide steel shims to achieve level and sound bearings. The Contractor is to provide all necessary shims, plates etc. in order to maintain uniform slopes, and sound bearing and anchorage.
- .5 Anchors in Masonry for Wall Plates:
- .1 Unless otherwise shown provide a minimum:
- .1 For Floor Joists: ..... Refer to typical details on drawings.
- .2 For Roof Joists: ..... Two (2) 20 mm [3/4"] diameter anchor rods by 600 mm [24"] long.
- .2 Embed all anchors vertically and grout in solid.

**3.6 Bearing/Wall Plates for Beams**

- .1 Provide a minimum of two (2) anchors, 12 mm [1/2"] diameter by 300 mm [12"] long with 50 mm [2"] hook, for all bearing plates on masonry shall be embedded vertically and grouted in solid unless specifically noted otherwise on the drawings.
- .2 Weld beams to plates with a minimum of two (2) 3 mm x 25 mm [3/16" x 1"] fillet welds unless noted otherwise.

### 3.7 Relation to Other Trades

- .1 Give all necessary directions for setting anchor rods, bearing plates and other members required to be built in with the work of other trades.
- .2 Verify the location and condition of all bearing surfaces placed by others. All such surfaces shall be at the elevations called for on the drawings and shall be truly level.
- .3 Commencement of erection implies acceptance of the work of other sections which affect the work of this section.
- .4 No claim for relief from contractual responsibility or for extras to the contract will be allowed unless such claim is made in writing prior to commencement of the work.
- .5 Ensure the proper bearing surface and amount of bearing is available to support steel members including open web steel joists.
- .6 Supply materials and all necessary directions for installation of all anchor rods and bearing plates, and also clips, angles and weld plates for steel deck if and as required. Co-ordinate with steel deck supplier for their actual requirements.
- .7 Weld approved anchor slots at 600 mm [24"] on center for adjustable masonry anchors, on all steel surfaces to be built into masonry.
- .8 Supply and install wall anchors, ceiling extensions, and header supports for trimming openings for all OWSJ.
- .9 Provide and reinforce to the approval of the Consultant, openings through beams required by other trades. Obtain approval of the Consultant for location of the holes. The cost for this work shall be paid for by the trade requiring the openings. Reinforce openings to maintain required design strength.
- .10 Provide at any time before the drawings are approved, punched holes from 11 mm to 27 mm [0.43" to 1.1"] diameter for the convenience of other trades as requested by them. Holes shall be placed so as not to cause any appreciable reduction in the strength of such members.
- .11 Co-ordinate with the Mechanical and Electrical Drawings and Trades to ensure that there is no interference between ductwork, suspended lighting fixtures and hangers, and the open web steel joists and bridging, or other structural steel members.
- .12 Wherever items are suspended from OWSJ, the securement shall be from the top chords of the joists at panel points only. Unless specific permission is given by the Structural Consultant.
- .13 Refer to drawings for CONCRETE FILLED COLUMNS.

### 3.8 Lintels

- .1 Generally lintels will be supplied only by this section and be placed by the General Contractor.
- .2 Lintels shall conform to the Lintel Schedules, Notes and Typical Details on the Structural drawings.
- .3 While every effort has been made to show all lintels which occur in load bearing masonry walls, it is the Contractor's responsibility to ensure that the correct size and quantity of lintels are provided.
- .4 Lintels in non-load bearing walls and partitions are generally NOT SHOWN ON THE DRAWINGS. All such lintels shall be provided as required and shall conform to the Notes & Typical Details on the structural drawings.
- .5 Refer also to **Galvanizing** earlier in this section.

### 3.9 Erection

- .1 Commencement of erection implies acceptance of the work of other sections which affect the work of this section.
- .2 No claim for relief from contractual responsibility or for extras to the contract will be allowed unless such claim is made in writing prior to commencement of the work.
- .3 Conform to the requirements of CSA S16.
- .4 Provide a competent and experienced supervisor.
- .5 Provide all necessary temporary bracing to keep structure safe and plumb. Bracing on structural drawings is for the finished building only.
- .6 Report all lack of fit to the Consultant before correction.
- .7 Provide and install all necessary packing under open web steel joist shoes. Packing to be of steel so placed as to distribute the joist reaction uniformly on the bearing.
- .8 Obtain written approval from the Consultant prior to field cutting or altering structural steel framing or open web steel joists or bridging.
- .9 Touch-up shop primer to bolts, welds, burned or scraped surfaces at completion of erection.

- .10 Provide proper coordination between the structural steel contractor, the mechanical and electrical contractors to ensure that all required openings through structural steel members or OWSJ are approved and are clearly detailed on the Shop Drawings before fabrication and erection. (Openings are to be reinforced to maintain the required design strengths.) The costs of such openings and/or for the provision of openings installed in the field, are to be borne by the Contractor or the trade requiring the opening, and are not extra to the Contract.

### **3.10 Tolerances**

- .1 Conform to CSA S16 and to the Typical Notes on the drawings.

### **3.11 Quality Control**

- .1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.
- .2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.
- .3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Consultants of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility. The contractor is solely responsible for quality control and shall implement its own supervisory and quality control procedures.
- .4 The structural steel fabricators shall be certified by the Canadian Welding Bureau to the requirements of CSA W47.1, division 1 or 2.
- .5 Searching visual inspection aided by a magnifying glass shall be carried out regularly on all joints during the course of welding and after completion by the fabricators designated welding supervisor, and also by the inspection company's representative. Emphasis shall be placed upon visual inspection to establish correct "Fit-Up" and "Pre-heating".
- .6 All welds are to be stamped with the operator's number or symbols and the fabricator's number assigned by the Canadian Welding bureau with the requirements of CSA Standard W59.
- .7 Finished shop work must be inspected and approved before shipping to site and field work must be inspected and approved before the removal of erection equipment from the job.

### 3.12 Notification

Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective. Advise the Inspection and Testing Company at least twenty-four (24) hours in advance of each fabrication and/or erection sequence.

### 3.13 Inspection and Testing

1. The General Contractor in agreement with the Prime Consultant will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.
2. The Inspection and Testing Company will conduct inspection and testing services per the following:
  - .1 Specification Section 01 45 23 – *Testing and Inspection Services – General Requirements.*
- .3 The following are responsibilities of the contractor regarding the Inspection and Testing Company:
  - .1 Co-operate with the representatives of the Inspection and Testing Company.
  - .2 Provide the Inspection and Testing Company with a copy of Specification, Structural Drawings and reviewed copies of shop drawings.
  - .3 Co-ordinate a program of inspection and testing with the Inspection and Testing Company, and advise the Consultant accordingly.

### 3.14 Defective Materials and Work

- .1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.



- .2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.
- .3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 05 21 19

## **PART 1 – GENERAL**

### **1.1 General Requirements**

- .1 The Contractor shall ensure that no asbestos containing materials are used in connection with the work of this section.

### **1.2 Reference Standards**

- .1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.
- .2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code.
- .3 Conform to the following CSA Standards:
  - .1 S136..... North American Specification for the Design of Cold Formed Steel Structural Members.
  - .2 W47.1..... Certification of Companies for Fusion Welding of Steel.
  - .3 W59..... Welded Steel Construction (Metal Arc Welding).
- .4 Conform to the following ASTM Standards:
  - .1 A653/A 653M ..... Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .5 Conform to the following Canadian Sheet Steel Building Institute Standards:
  - .1 CSSBI 10M ..... Standard for Steel Roof Deck.
  - .2 CSSBI 12M ..... Standard for Composite Deck.
  - .3 CSSBI B13..... Design of Steel Deck Diaphragms.
- .6 Comply with any Fire Rated Assembly Design specified for the Project.

- .7 In the event of conflict between reference standards, codes, drawings and specifications, the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally the more stringent provision shall govern. No extras to the contract will be approved due to such clarification.
- .8 Conform to the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, last amendment.

### **1.3 Design Requirements**

- .1 Design steel deck using limit states design in accordance with CSA S136, CSSBI 10M and CSSBI 12M.
- .2 Wherever structural framing permits, steel deck shall be designed and fabricated to span continuously over at least four (4) supports (3 spans).
- .3 Provide an adequate increase in thickness of metal to compensate for continuity wherever fewer supports may occur.
- .4 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.
- .5 Deflection of roof deck under specified live or snow load not to exceed 1/300 of span.

### **1.4 Shop Drawings**

- .1 Submit erection drawings in accordance with directions.
- .2 Fabrication shall not commence until drawings are reviewed.
- .3 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.
- .4 When requested shop drawings are to bear the Seal and Signature of the Licensed Professional Engineer responsible for the design.
- .5 When requested submit design calculations complete with Stamp and Signature of the responsible Professional Engineer.
- .6 Allow ten (10) working days for the review of shop drawings and supply as many copies for review and distribution as directed. Shop drawings shall be checked in detail by the General Contractor before submission. Drawings which fail to meet this requirement shall be returned marked NOT REVIEWED.
- .7 The review of such drawings shall not relieve the Contractor of the responsibility of seeing that this work is complete, accurate and in conformity with the drawings and the specification.

## **PART 2 – PRODUCTS**

### **2.1 Materials**

- .1 STEEL SHEET to ASTM A653/A653M (Structural quality) minimum grade 275 MPa [40 ksi] with a base nominal thickness (BNT) as noted on the drawings.
- .2 ZINC COATING
  - .1 Unless otherwise noted, provide a ZF75 (galvanneal) coating as designated by ASTM A653/A653M.
  - .2 Where specified on drawings as GALVANIZED DECK, provide a Z275 coating as designated by ASTM A653/A653M.
  - .3 Deck surfaces which are designated for finish painting (Refer to Architectural Drawings & Finish Schedules) shall not receive chemical treatment that will adversely affect paint application.
- .3 TYPES OF DECKING:
  - .1 Roof deck: Shall be single fluted element with ribs of depth as shown on the drawings.
  - .2 Composite deck: shall be single fluted element with ribs of depth as shown on the drawings and with integral lugs formed on the vertical faces of the flutes.
  - .3 Acoustic deck: shall be single fluted element with ribs of depths as shown on the drawings and with perforations on the vertical faces of the flutes, complete with a sound absorbing strip (fiberglass density 17.6 kg/m<sup>3</sup> [1.1 lb/ft<sup>3</sup>]) supplied by the deck fabricator for installation by the roofing contractor.
  - .4 Pre-finished deck: where deck is designated to be pre-painted, provide:
    - .1 Colorite HMP
    - .2 8000 Series
    - .3 10000 Series
    - .4 Metallic Series
    - .5 Elite Series
    - .6 Barrier Series

Colour to be selected later by the Architect from the manufacturer's standard colour chart.
  - .5 Deck shall have interlocking side joints between panels.

.4 FASTENERS FOR PRE-FINISHED DECK:

- .1 Unless otherwise noted, provide self-drilling or self-tapping corrosion resistant fasteners.  
Acceptable type: #14 TEK screws or an approved equivalent.

.5 CLOSURES:

- .1 Provide cover plates, edge stiffeners, cell closures and flashings from sheet steel similar to decking with a base nominal thickness of 0.76 mm [0.03"] (22 gauge). (Refer to Architectural Drawings).
- .2 Provide and install closures at the top of all walls. Type to match the profile and finish of selected decking.
- .3 Provide sheet steel angles and closure plates as required at junctions of columns, openings and walls with concrete slabs and similar locations to prevent leakage of concrete, complete with fasteners, stiffeners and accessories as required.

.6 PRIMER: conform to CAN/CGSB-1.181.

- .1 Acceptable product: CARBOZINC 11 by Carbolene.

.7 METAL UPSTANDS/CURBS:

- .1 Where required by the Architectural Drawings provide and install 1.6 mm [0.063"] (16 gauge) galvanized metal upstands.

## **PART 3 – EXECUTION**

### **3.1 Preparation**

- .1 Verify the location and condition of all bearing surfaces placed by others. All such surfaces shall be at the elevation called for on the drawings.
- .2 Commencement of erection implies acceptance of the work of other sections, which affect the work of this section.
- .3 No claim for relief from contractual responsibility or for extras to the contract will be allowed unless such claim is made in writing prior to commencement of the work.
- .4 Protect steel deck during shipping and handling in accordance with CSSBI standards.
- .5 The steel deck welder must be certified to CSA W47.1 for fusion welding of steel deck.

### 3.2 Fabrication & Erection

- .1 Conform to CSA S136, CSA W59, CCSBI 10M and CCSBI12M.
- .2 Erect steel decking as indicated to manufacturer's direction and to reviewed shop drawings.
- .3 No hangers or brackets supporting mechanical and electrical services, artwork, ceilings, bulkheads, lighting, etc. shall be hung directly from the roof deck. All point loads must be applied directly to structural steel framing unless otherwise shown or approved by structural consultant.
- .4 Accurately align the deck and lap at supports. Use 50 mm [2"] minimum lap.
- .5 Supply and place steel packing as required to produce an even bearing pressure at supports.
- .6 Any material which has been damaged shall be replaced at no expense to the owner.
- .7 Provide for ribs to bear on beams parallel to flutes when tops of such beams are at same elevation as deck bearing.
- .8 Provide reinforcing stiffeners for unsupported edges of metal deck.
- .9 Install 50 x 50 x 6 mm [2" x 2" x ¼"] steel angles or formed channels perpendicular to flutes, welded to 2 flutes each side of opening for deck openings from 150 to 450 mm [6" to 18"] in size. No reinforcement required for openings cut in the deck that are smaller than 150 mm [6"] square.
- .10 For deck openings over 450 mm [18"] and for areas of concentrated load, reinforce in accordance with structural framing details.
- .11 For areas with concrete fill, supply and install all required sheet steel angles and closure plates to contain concrete.
- .12 Install closures and upstands as shown on drawings and reviewed shop drawings.
- .13 For steel roof deck, after alignment and levelling and unless otherwise noted on drawings, the minimum attachment of the deck to the bearing surfaces and the minimum side lap connections between deck units shall be:
  - .1 For 38 mm deck profiles, connect the first, third, fifth and seventh low corrugations (36/4 configuration), and each support parallel to flute direction at 300 mm [12"] maximum centers. Connections shall be made using either an arc spot weld with 20 mm [¾"] nominal top diameter, or mechanically fastened using Hilti powder actuated fasteners (X-HSN24, HILTI X-ENP19, or equivalent).

- .2 For 76 mm deck profiles, connect the first, third and fifth low corrugations (24/3 configuration), and each support parallel to flute direction at 300 mm [12"] maximum centers. Connections shall be made using either an arc spot weld with 20 mm [3/4"] nominal top diameter, or mechanically fastened using Hilti powder actuated fasteners (X-HSN24, HILTI X-ENP19, or equivalent).
- .3 For roof decks, side laps of adjacent nestable units shall be crimped together at 900 mm [36"] centres, or fastened with Hilti M HWH screws (SLCO1, SLC02, or equivalent) at 900mm [36"] on centre.
- .14 TOUCH UP
  - .1 Immediately after decking is permanently secured in place, touch up galvanized surface with specified primer where burned by welding, or where surface coating has been damaged or partially removed during transit or in erection.
    - .1 Touch-up galvanized surfaces with coating complying with SSPC-PAINT 20.
  - .2 For top surfaces of deck where concrete fill is going to be installed, touch-up primer is not required.

### 3.3 Quality Control

- .1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.
- .2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.
- .3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Consultants of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility. The contractor is solely responsible for quality control and shall implement its own supervisory and quality control procedures.

### 3.4 Notification

- 1. Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

### 3.5 Inspection and Testing

1. The General Contractor in agreement with the Prime Consultant will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.
2. The Inspection and Testing Company will conduct inspection and testing services per the following:
  - .1 Specification Section 01 45 23 – *Testing and Inspection Services – General Requirements*.
  - .3 The following are responsibilities of the contractor regarding the Inspection and Testing Company:
    - .1 Co-operate with the representatives of the Inspection and Testing Company.
    - .2 Provide the Inspection and Testing Company with a copy of Specification, Structural Drawings and reviewed copies of shop drawings.

### 3.6 Defective Materials and Work

- .1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.
- .2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.
- .3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 05 30 00



## **PART 1 – GENERAL**

### **1.1 General Instructions**

- .1 This specification section is a “Performance Specification”, outlining parameters which shall apply to this work.
- .2 Refer to drawings and other sections of the specification.
- .3 The Contractor is to ensure that NO ASBESTOS containing materials are used in connection with the work of this section.

### **1.2 Work Included**

- .1 This section includes but is not limited to the product design, manufacture, transportation, and erection of cold-formed lightweight steel framing components:
  - .1 Wind Bearing Studs
- .2 This section also includes design, manufacture, transportation, and erection of all anchorages, tracks, bridging, cross-bracing, screws, blocking, stiffeners, inserts and similar accessories required for work under this contract.
- .3 Supply information required for the installation of supports, inserts, and similar accessories required for the work under this contract supplied and to be installed by others.

### **1.3 Related Work**

- .1 Non-load bearing partition framing.

### **1.4 Reference Standards**

- .1 Comply with The Building Code Act, as amended, the 2012 Ontario Building Code (OBC) as amended and Regulations and by-laws of other authorities having jurisdiction, including latest amendments thereto; all hereafter referred to as Building Code.
- .2 All codes, standard specifications and by-laws referred to in this Specification shall be current editions including all latest revisions, addenda and supplements, unless otherwise noted in the Building Code.
- .3 Conform to the following CSA Standards:
  - .1 S136..... North American Specifications for the Design of Cold-Formed Steel Structural Members.
  - .2 W47.1..... Certification for Companies for Fusion Welding of Steel Structures.

- .3 W59..... Welded Steel Construction (Metal Arc Welding).
- .4 W178.1..... Certification of Welding Inspection Organisations.
- .5 W178.2..... Certification of Welding Inspectors.
- .4 Conform to the following ASTM standards:
  - .1 A123/A123M ..... Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
  - .2 A653/A653M ..... Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .3 A780/A780M ..... Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - .4 A879/A879M ..... Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
- .5 Conform to Canadian Sheet Steel Building Institute Standard CSSBI 51, Lightweight Steel Framing Design Manual.
- .6 Conform to the Occupational Health and Safety Act, R.S.O. 1990, c. O.1, last amendment.
- .7 In the event of conflict between reference standards, codes, drawings and specifications the Contractor shall request clarification by the Consultant. The Consultant's decision as to which requirements govern shall be final and binding. Generally the more stringent provision shall govern. No extras to the contract will be approved due to such clarification.

## **1.5 Design Criteria**

- .1 Design shall be based on Limit States Design principles using factored loads and resistances.
- .2 Loads and load factors shall be in accordance with the Ontario Building Code.
- .3 Resistances and resistance factors shall be determined in accordance with the Ontario Building Code and CSA S136.

- .4 Conform to the requirements of specified fire rated assemblies.
- .5 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines of bridging. Collateral sheathing may be used to help restrain member rotation and translation perpendicular to the minor axis for wind bearing studs. The spacing of bridging shall not exceed the following:
  - .1 Wind bearing studs..... 1200 mm [48"] o/cCloser spacing may be required to satisfy structural requirements.
- .6 For stud walls, anchor top and bottom track to the structure at a maximum spacing of 800 mm [32"] o/c. Closer spacing may be required to satisfy structural requirements.
- .7 The spacing of studs shall not exceed the following:
  - .1 Wind bearing studs..... 400 mm [16"] o/cUse lesser spacing as required by the design criteria.
- .8 Design stud depths as shown on the drawings. Adjust material thicknesses and spacing as required by the design criteria. Use of greater depths of studs only with approval of the Project Engineer.
- .9 Maximum deflections under specified loads shall conform to the following:
  - .1 Wall studs supporting masonry veneer, L/720.
  - .2 Wall studs supporting other finishes, L/360.
  - .3 Building sway due to all effects, 1/400 of building height or 1/500 of storey height.
- .10 Design lightweight steel framing components and assemblies to accommodate specified erection tolerances of the structure.
- .11 For wind bearing studs, design connections to accommodate vertical deflection movement of the structure, frame shortening and vertical tolerances without imposing axial loads onto the framing. Leave minimum gap of 12 mm [1/2"].
- .12 Design anchorage and splice details for bridging.
- .13 Design for local loading due to anchorage of cladding and interior wall mounted fixtures where shown.
- .14 Connections between lightweight steel framing members shall be by bolts, welding or sheet metal screws.

- .15 Allow for appropriate eccentricities in the design of axial load bearing members.
- .16 Design interior axial load bearing walls with a nominal lateral wind load of 0.48 kPa in combination with the required axial loads.
- .17 Provide head, sill and jamb members and connections to frame openings.

## **1.5 Source Quality Assurance**

### **.1 SUBMITTALS**

- .1 Submit two (2) certified copies of mill reports covering chemical and mechanical properties, and coating designation of steel used in this work.
- .2 Submit representative pieces of all framing component parts including mechanical fasteners if used. The length of pieces submitted need not exceed 300 mm [12"]. Tag pieces with the name of the part, the metal thickness exclusive of coating and the manufacturer.
- .3 Submit copies as directed of engineering calculations or data verifying the capacity of the members and the ability of the assemblies to meet the design requirements.

### **.2 SHOP DRAWINGS**

- .1 Submit copies as directed of shop drawings.
    - .1 Each shop drawing submitted shall bear the stamp and signature of a qualified Professional Engineer registered in the Province of Ontario and experienced in the design of lightweight steel framing.
    - .2 Include all 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.
  - .2 The review of shop drawings shall NOT relieve the Contractor of the responsibility of seeing that this work is complete, accurate and in conformity with the drawings and this specification.
  - .3 Only shop drawings bearing the review stamps shall be kept at the site.
- .3 Do not fabricate until all submittals are reviewed.

- .4 Submit product data for mechanical fasteners indicating sizes, load capacities and type of corrosion protection.

## **PART 2 – PRODUCTS**

### **2.1 Acceptable Manufacturers as published by the Canadian Sheet Steel Building Institute.**

### **2.2 Materials**

- .1 Steel shall have metallic coatings that conform to ASTM A653/A653M.
- .2 Steel shall conform to the requirements of CSA S136 and shall be identified as to specification, type, grade and mechanical properties.
- .3 Wall members forming part of the exterior building envelope shall have a minimum coating of Z180 galvanizing in accordance with A653/A653M. Other coatings (e.g. aluminum-zinc alloy) providing equal or better corrosion protection may be used.
- .4 Interior members not forming part of the exterior building envelope shall have a minimum coating of Class C electro-galvanizing in accordance with ASTM A879/A879M.
- .5 Sheet metal screws shall have a minimum coating thickness of 8 micrometers [0.315 mils] of zinc or cadmium. Other coatings providing equal or better corrosion protection may be used.
- .6 Welding electrodes shall be of the 480 MPa [70 ksi] minimum tensile strength series (e.g. E480XX, E480S-X).
- .7 Zinc rich paint for touching up welds and damaged metallic coatings shall be CARBOZINC 11 WB or CARBOZINC 11 Gray (0700) by Carboline or an approved equivalent.
- .8 Material used to fabricate steel framing shall comply with the thickness tolerance requirements of CSA S136.

## **PART 3 – EXECUTION**

### **3.1 General**

- .1 Fabrication and erection shall conform to the approved shop drawings. Modifications required to accommodate as-built conditions (other than minor dimensional changes) shall be submitted for approval.
- .2 Fabrication and erection shall be by a member company in good standing with the Canadian Sheet Steel Building Institute (CSSBI).

### **3.2 Welding**

- .1 Companies engaged in welding shall be certified by the Canadian Welding Bureau to CSA W47.1. Companies shall have welding procedures approved and welders qualified for the base material types and thicknesses that are to be welded.
- .2 Welds shall conform to CSA W59.
- .3 For material less than 3 mm thick [1/8"], shop drawings may show nominal weld leg sizes. For such material, the effective throats of welds shall not be less than the thickness of the thinnest connected part.
- .4 Touch-up welds with zinc rich paint.

### **3.3 Screws**

- .1 Steel screws shall be of the minimum diameter indicated on the shop drawings.
- .2 Penetration beyond joined materials shall be not less than three (3) exposed threads.
- .3 Thread types and drilling capability shall conform to the manufacturer's recommendations.
- .4 Screws covered by sheathing materials shall have low profile heads.

### **3.4 Fabrication**

- .1 Where specified, provide cut-outs centered in the webs of members to accommodate services. Unreinforced cut-outs shall be limited to the dimensions in Table 1 in CSSBI 51-06. The effect of cut-outs on the strength and stiffness of the member shall be considered.
- .2 Fabrication tolerances for members shall conform to Table 2 in CSSBI 51-06.
- .3 The steel thickness exclusive of coating shall be marked on each member by embossing, stamping with indelible ink or by colour coding.

### **3.5 Storage of Materials**

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

### **3.6 Erection**

- .1 Methods of construction may be either piece by piece (stick-built) or by fabrication into panels (panelized) either on or off site.

- .2 Cold-formed lightweight steel framing shall be erected true and plumb within the specified tolerances. Temporary bracing shall be employed wherever necessary to withstand all loads to which the structure may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long as required for the safety and integrity of the structure. The Erector shall ensure that during erection a margin of safety consistent with the requirements of the Ontario Building Code and CSA S136 exists in the uncompleted structure.
- .3 ERECTION TOLERANCES
  - .1 For the purposes of this section, camber is defined as the deviation from straightness of a member or any portion of a member with respect to its major axis, and sweep is defined as the deviation from straightness of a member or any portion of a member with respect to its minor axis.
  - .2 For interior load bearing studs, out of plumbness and out of straightness (camber and sweep) shall not exceed 1/1000 of the member length.
  - .3 For exterior studs, out of plumbness shall not exceed 1/500 of the member length. Out of straightness (camber and sweep) shall not exceed 1/1000 of the member length.
  - .4 For track, camber shall not exceed 1/1000 of the member length.
  - .5 Studs shall seat into top and bottom tracks. The gap between the end of the stud and the web of the track shall not exceed 1.5 mm [1/16"] for axial load bearing studs.
  - .6 Align adjacent prefabricated panels to provide surface continuity at the interface.
  - .7 Spacing of studs shall not be more than  $\pm 3$  mm [1/8"] from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.
- .4 Make all field measurements necessary to insure the proper fit of all members.
- .5 Cutting of members may be by saw or shear. Torch cutting is NOT permitted.
- .6 All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
- .7 Complete bearing shall be maintained under tracks to provide for load transfer in axially loaded assemblies. Any discrepancy shall be brought to the attention of the Project Engineer.
- .8 Holes that are field cut into lightweight steel framing members shall conform to the requirements of this specification.

- .9 Splicing of axial load bearing members is NOT permitted.
- .10 Insulation equal to that specified shall be placed in all jamb and header assemblies that will be inaccessible after their installation into the wall. Insure that insulation is kept dry and not compressed.
- .11 Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.

### **3.7 Field Quality Control**

#### **.1 GENERAL**

- .1 The lightweight steel framing Design Engineer, responsible for the production of the shop drawings, shall provide periodic field review during construction and shall submit reports in accordance with directions.
  - .1 The cost of this field review shall be included in the Contract price.

#### **.2 INSPECTION & TESTING**

- .1 Additional inspection and testing of materials and workmanship will be carried out by a qualified Independent Inspection Agency appointed by the Owner.
  - .1 The cost of this additional inspection shall be paid for out of the Cash Allowances for Inspection and Testing.
  - .2 Any testing or inspection required because of an error by the Contractor or due to departure from the contract documents by the Contractor, shall be paid for by the Contractor.

#### **.3 RESPONSIBILITY OF THE CONTRACTOR**

- .1 The Contractor shall provide the necessary cooperation to insure that the inspection can proceed.
- .2 Inspections do not relieve the Contractor of his responsibility for the performance of the contract. The Contractor is solely responsible for quality control and he shall implement his own supervisory and quality control procedures.
- .3 Materials or workmanship not conforming to the requirements of the contract documents may be rejected at any time during the progress of work.

### **3.8 Defective Work**

- .1 Erection not meeting the requirements of the specifications and drawings shall be deemed defective work.



- .2 Defective work and work not conforming to lines, details, quality and grade specified as shown on the drawings shall be modified or replaced at no cost to the Owner, and to the satisfaction of the Consultant.
- .3 Finished lines, dimensions and surfaces shall be correct and true within tolerances specified.

### **3.9 Clean-Up**

- .1 Upon satisfactory completion of the work, clear away from the building and premises all tools, utensils, apparatus, excess or waste materials and debris resulting from the operations, and leave all complete and in a condition acceptable to the Architect.

### **3.10 Quality Control**

- .1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.
- .2 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and give recommendations in writing.
- .3 The Consultant 's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Consultants of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility.

### **3.11 Notification**

- .1 Prior to commencing significant segments of the work, give the Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

### **3.12 Inspection and Testing**

- .1 The General Contractor in agreement with the Prime Consultant will appoint an Independent Inspection and Testing Companies to make inspections or perform tests as the Consultant directs. The Independent Inspection and Testing Companies shall be responsible only to the Consultant, and shall make only such inspections or tests as the Consultant may direct. The representative of the Inspection and Testing Company shall NOT be required to supervise or instruct the Contractor.

### **3.13 Defective Materials and Work**

- .1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength, made and the like, in order to help determine whether the work must be corrected or replaced. Tests, inspections or surveys or calculations carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.
- .2 All testing shall be conducted in accordance with the requirements of The Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.
- .3 Materials or work which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION 05 41 00

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SUMMARY**

- .1 The *Work* of this Section includes metal fabrications and related metals including, but not limited to, the following:
  - .1 Pipe rails.
  - .2 Handrails, guards, balustrades, toe guards, steel guardrail mesh.
  - .3 Stairs, Hose tower stairs
  - .4 Bollards.
  - .5 Loose steel lintels.
  - .6 Steel angles.
  - .7 Roof access ladders.
  - .8 Four-fold door frames.
  - .9 Overhead door frames.
  - .10 Steel posts for patio fence.
  - .11 Steel pedestals.
  - .12 Steel caging.
  - .13 Stainless Steel Countertops

### **1.3 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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: The *Contractor* shall ensure that the work of this Section is 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 five years.
- .2 Licensed professionals: retain a *Professional Engineer* to design the work of this Section; to prepare, seal and sign *Shop Drawings*; and to perform field review. *Shop Drawings* shall show both design and installation requirements.
- .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 the *Authorities Having Jurisdiction*.

## 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 the *Contractor* and to meet requirements of the construction schedule.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE/DESIGN REQUIREMENTS

- .1 Design, fabricate, and install work of this Section in accordance with the Ontario Building Code and requirements of all other *Authorities Having Jurisdiction*.
- .2 Welding:
  - .1 Weld structural components in steel to conform to requirements of CSA W59-15, and by a fabricator fully certified by the Canadian Welding Bureau to conditions of CSA W47.1-09(2014) and CSA W55.3-08 (R2013) as applicable or equivalent certification acceptable to the *Consultant*.
- .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 ft)
  - .2 Maximum variation from level:
    - .1 3.2 mm (1/8") in 9 m (30 ft).
  - .3 Maximum variation from straight:
    - .1 3.2 mm (1/8") in 3 m (10 ft) under a 3 m (10 ft) straight edge.
  - .4 Maximum variation from angle indicated:
    - .1 10 seconds.
  - .5 Tolerances shall be non-cumulative.

- .4 Design of metal fabrications to be by a *Professional Engineer*, except work designed on the structural *Drawings*. The *Contractor* shall ensure that the *Professional Engineer* is experienced in this type of engineering work and in accordance with Section 01 33 00 – Submittal Procedures.

## 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*.
- .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 *Contractor's Professional 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 on the Contract drawings.
- .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 *Equivalent*.
- .6 Stainless steel sheet and plate: ASTM A167-99(2004), Type 316, 1.6 mm thick, unless otherwise indicated or scheduled.

## 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: in accordance with ASTM A307-14.
- .5 High strength bolts: in accordance with ASTM A325-14.
- .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: in accordance with CSA W59-15.
- .3 Grout:
  - .1 Epoxy grout; non-shrink, non-expanding:
    - .1 Hilti 'HY-150'.
    - .2 Sika Group 'Sika AnchorFix 3001'.
    - .3 W.R. Meadows of Canada 'REZI-WELD 3/2 EPOXY GROUT/PATCH'.
    - .4 Or *Equivalent*.
  - .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'.
    - .3 Or *Equivalent*.
- .4 Dielectric separator: Best grade, quick drying non-staining alkali resistant bituminous paint in accordance with CAN/CGSB 1.108-M89, or membrane type to acceptance of the *Consultant*.

## 2.4 FINISHES

- .1 Shop primer; steel: CISC/CPMA 2-75 or SSPC-Paint 20, Paint Specification No. 20: Zinc-Rich Primers (Type I "Inorganic" and Type II "Organic").
- .2 Shop primer; galvanized steel in pool or arena environments: in accordance with Section 09 91 00 - Painting.
- .3 Zinc rich paint; steel: Two-component zinc-rich coating, zinc powder to ASTM D520 Type III, SSPC-Paint 20, Type 1 Inorganic or single-component zinc-rich coating to SSPC-Paint, Type 2 Organic, CAN/CGSB 1.181-M99, VOC content <100 g/l to ASTM- D1475.
  - .1 Acceptable Products:
    - .1 Aervoe Industries, Inc. 'Low VOC Cold Galvanize Coating 93% Zinc'.
    - .2 ZRC Worldwide 'ZRC Zero-VOC Galvanizing Compound'.
    - .3 Or *Equivalent*.
- .4 Hot dip galvanizing: in accordance with Section 05 04 00 Hot-Dip Galvanizing.
  - .1 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: Satin finish

## 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 W59-15 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 the *Authorities Having Jurisdiction*. 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 floors are designed unless indicated otherwise.
  - .4 Drill drainage holes at exterior exposed tubular fabrications to permit drainage of moisture to exterior of metal fabrications.
- .3 Assembly:
  - .1 Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes.
  - .2 *Provide* smooth welds with splatter removed where exposed to view.
  - .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.
- .4 Shop prime painting:
  - .1 Clean loose mill scale, rust, dirt, weld flux and spatter from the work after fabrication.
  - .2 Prepare and prime paint in accordance with manufacturer's installation instructions. Prepare steel by methods specified in CISC/CPMA 2-75 or SSPC SP3.
- .5 Galvanizing:
  - .1 Galvanize metal fabrications following fabrication in accordance with the requirements of Section 05 04 00 Hot-Dip Galvanizing.

- .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, rust scale to SSPC-SP3, mill scale to SSPC-SP6.
- .3 Fill vent and drain holes that are exposed in the finished work, unless indicated on the Contract drawings to remain as weep holes in exterior fabrications, by plugging with zinc solder and filing off smooth.

## **PART 3 - EXECUTION**

### **3.1. EXAMINATION**

- .1 Take measurements at the *Place of the Work* to ensure that metal fabrications are fabricated to fit surrounding construction, around obstructions and projections in place, or as indicated on the Contract drawings and to suit service locations. The *Contractor* shall be responsible for confirming all *Site* dimensions.

### **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 by the *Authorities Having Jurisdiction*. Weld in accordance with CSA-S16-09.
- .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 *Subcontractors* together with setting templates.

### **3.3. FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.

### **3.4. ADJUSTING AND CLEANING**

- .1 After erection, touch up primed surfaces that are burned, scratched or otherwise damaged with prime paint to match shop paint.
- .2 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, rust scale to SSPC-SP3, mill scale to SSPC-SP6.



- .3 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new, at the *Contractor's* expense.

### **3.5. PROTECTION**

- .1 Maintain protection of work of this Section from time of installation until final finishes are applied or to final cleanup.
- .2 Protect finished surfaces from damage.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 System Description
- .5 1.5 Delivery, Storage & Handling
- .6 2.1 Bollard Sleeves
- .7 2.2 Materials
- .8 3.1 Examination
- .9 3.2 Installation

### **1.3 SUMMARY**

- .1 Post Guard polyethylene plastic pipe sleeves for steel pipe bollards.

### **1.4 SYSTEM DESCRIPTION**

- .1 Performance Requirements
  - .1 High molecular weight material. Designed for optimum balance of density, molecular weight and molecular weight distribution demonstrating maximum property advantages for large products that require high impact resistance.
  - .2 Ultraviolet Protection Additive. Five Year UV stabilizer package. Warranty Five Years.
  - .3 Thickness Nominal wall thickness will be 0.125 inch
  - .4 Abrasion Resistant
  - .5 Environmental Stress Cracks Resistant
  - .6 Reflective Tape: Each Post Guard has two strips of 3M Series or *Equivalent* Reflective tape recessed on the part 5.875 inches apart
  - .7 Flexural Modulus: 200,000 psi
  - .8 Tensile Strength: 4,000psi

### **1.5 DELIVERY, STORAGE & HANDLING**

- .1 The *Contractor* shall place order in a timely fashion to ensure construction schedule is not adversely impacted.
- .2 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

## **PART 2 - PRODUCTS**

### **2.1 BOLLARD SLEEVES**

- .1 Manufacturer:
  - .1 Encore Commercial Products Inc. - Sure Guard
  - .2 Contact information: 5 Shirley Ave. Kitchener Ontario N2B 2E6.
  - .3 Tel: 519-772-1976, Toll Free: 1-800-756-3537, Fax: 519-570-4333
  - .4 Email: info@sureguard.ca
  - .5 website: www.sureguard.ca;
  - .6 Or *Equivalent*.

### **2.2 MATERIALS**

- .1 High-density polyethylene (HDPE) and High-density polyethylene (LDPE)
  - .1 Size: as required for all bollards.
  - .2 Colours: to be selected from manufacturer's full range.
  - .3 Tape colors: to be selected from manufacturer's full range.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify the steel pipe cores are set true, correctly aligned and well anchored in below grade concrete encasement.
- .2 Fill cores with concrete and strike level across the top of pipe.

### **3.2 INSTALLATION**

- .1 Centre two foam strips (included) over bollard. Slide the Post Guard over the bollard and foam will expand for a snug fit.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 GENERAL
- 1.4 IDENTIFICATION OF SYSTEMS
- 1.5 COMMISSIONING AND SYSTEMS DEMONSTRATIONS
- 1.6 SUPERINTENDENCE
- 1.7 DIMENSIONS
- 1.8 COORDINATION
- 1.9 BUILDING DIMENSION, TEMPLATES, BUILT-INS, AND COORDINATION

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

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

### **1.3 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.

### **1.4 IDENTIFICATION OF SYSTEMS**

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

### **1.5 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 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 77 00.

### **1.6 SUPERINTENDENCE**

- .1 The *Contractor* shall *Provide* superintendent and necessary supporting staff personnel who shall be in attendance at the *Place of the Work* while *Work* is being performed, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.
  - .1 The *Contractor* shall *Provide* a qualified superintendent to supervise the *Work* at all times.
- .2 The *Contractor* shall appoint a superintendent at the *Place of the Work* who shall have overall authority at the *Place of the Work* and shall speak for the *Contractor* and represent the

*Contractor's* interest and responsibilities at meetings at the *Place of the Work* and in dealings with the *Consultant* and the *Owner*.

## 1.7 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.

## 1.8 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.

## 1.9 BUILDING DIMENSION, TEMPLATES, BUILT-INS, AND COORDINATION

- .1 Take necessary dimensions for the proper execution of the *Work*. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.
- .2 *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, in accordance with Section 01 33 00.
- .11 *Subcontractors* shall direct related *Subcontractors* on site of specific locations required for sleeves and openings. The *Contractor* shall be responsible for coordinating such activity to ensure no interruption in the progress of the *Work*.
- .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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Delivery, Storage, and Handling
- .6 2.1 Wood Materials
- .7 2.2 Wood Treatment
- .8 2.3 Panel Materials
- .9 2.4 Sheathing Materials
- .10 2.5 Fastenings and Hardware
- .11 2.6 Source Quality Control
- .12 3.1 General
- .13 3.2 Curbs, Supports, and Blocking at Roofing Assemblies
- .14 3.3 Equipment Backboard
- .15 3.4 Miscellaneous Plywood Blocking

### **1.3 SUMMARY**

- .1 The work of this Section includes, but is not necessarily limited to, the following:
  - .1 Plywood backing panels and wood studs.
  - .2 Wood grounds, nailers, blocking and sleepers.
  - .3 Wood roof blocking.
  - .4 Wood panel sheathing.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Shop Drawings:
  - .1 Clearly indicate details of construction, profiles, jointing, fastening and other related details.
- .3 Certificates:
  - .1 Pressure treated lumber and plywood shall be accompanied by *Supplier's* certificate of conformance with this *Specification*.

## 1.5 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 in the *Contract Documents*, lumber must be softwood, S4S, moisture content not greater than 19% at time of installation, in accordance with following standards:
    - .1 Canadian Standards Association (CSA) O141-05.
    - .2 National Lumber Grades Authority (NLGA) 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.
    - .3 Dimension lumber species and grades:
      - .1 Spruce-Pine-Fir.
      - .2 Light framing to NLGA Construction grade, S-Dry.
      - .3 Planks to NLGA No. 2 grade, S-Dry.
      - .4 Boards to NLGA No. 4 Common grade, S-Dry.
    - .3 Curbs, nailers, plywood for roofing: Spruce species, NLGA construction grade, sound and free of imperfections or deficiencies making unsuitable for use. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
      - .1 Pressure treat with wood preservative.
    - .4 Studs and framing: Spruce, Pine, Fir (S-P-F) species group, S-Dry or kiln dried, Stud Grade or No. 2 Grade unless otherwise indicated in the Contract documents

### 2.2 WOOD TREATMENT

- .1 Wood preservative pressure treatment:
  - .1 Wood shall be pressure impregnated with fire-retardant chemicals in accordance with CAN/CSA O80 and have flame-spread rating of not more than 25 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): in accordance with CSA O151-09.



- .2 Douglas Fir plywood (DFP): in accordance with CSA O121-08.

## 2.4 SHEATHING MATERIALS

- .1 Exterior sheathing:
  - .1 Exterior grade plywood, thicknesses as follows:
    - .1 Walls: 12.7 mm (1/2") minimum, unless otherwise indicated in the Contract documents.
    - .2 Roofs: 15.9 mm (5/8") minimum, unless otherwise indicated in the Contract documents.

## 2.5 FASTENINGS AND HARDWARE

- .1 General:
  - .1 *Provide* fasteners of size and type indicated in the Contract documents, acceptable to the *Authorities Having Jurisdiction*, and that comply with requirements specified in this Section 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 in the Contract documents.
    - .1 To hollow masonry, plaster and panel surfaces use 9 mm (11/32") expansion bolts.
    - .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.
    - .2 For pressure-preservative-treated wood, use stainless-steel Type 304 fasteners.
  - .5 Hardware materials:
    - .1 Hot-dipped galvanized in accordance with 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 Sheathing fasteners: Bugle head, corrosion resistant steel, power driven type, minimum length of 3 times thickness of sheathing.

- .3 Sill plate anchors: 15.9 mm (5/8") diameter bolts, spaced not more than 1.6 m (5'-1/4") on centre (o.c). Embed anchor bolts 150 mm (6") minimum into foundation wall so that they may be tightened without withdrawal from concrete. Washers: 2.5 times size of bolt and HEX nuts.

## 2.6 SOURCE QUALITY CONTROL

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board or equivalent certification acceptable to the *Consultant*.

## PART 3 - EXECUTION

### 3.1 GENERAL

- .1 Layout work carefully and to accommodate work of other Subcontractors. Cut and fit accurately. Erect in position indicated in the contract drawings. 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 the 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.
- .9 Secure wall sheathing horizontally perpendicular to studs, with ends staggered, over firm bearing.

### 3.2 CURBS, SUPPORTS, AND BLOCKING AT ROOFING ASSEMBLIES

- .1 Install wood 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 in the Contract documents.
- .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 in the contract drawings, complying with the following:
  - .1 Attach each item in the build-up with fasteners or anchors at spacing not exceeding the following:

- .1 Wood to wood:
  - .1 Screws: 450 mm (18").
  - .2 Nails: 300 mm (12").
- .2 Wood to metal:
  - .1 Screws: 450 mm (18").
  - .2 Bolts/washers: 1220 mm (48").
- .3 Wood to concrete/concrete block:
  - .1 Tapcon type screws: 450 mm (18").
  - .2 Expansion/toggle bolts/washers: 1220 mm (48").
- .2 Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces.
- .3 Size fasteners for embedment into substrate in accordance with manufacturer's installation 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, 23, 26, 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 in the Contract drawings.
- .2 Complete wood blocking within gypsum board metal stud assemblies in accordance with work of Section 09 22 00 - Metal Supports for Gypsum and Cement Board.

**END OF SECTION**

## **PART 1- GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 General Instructions
- 1.2 Section Includes
- 1.3 Summary
- 1.4 Administrative Requirements
- 1.5 Submittals
- 1.6 Closeout Submittals
- 1.7 Quality Assurance
- 1.8 Delivery, Storage, and Handling
- 1.9 Field Conditions
- 2.1 Performance/Design Requirements
- 2.2 General
- 2.3 Wood Materials
- 2.4 Panel Materials
- 2.5 Fasteners and Adhesives
- 2.6 Hardware
- 2.7 Finishes – Interior Architectural Woodwork
- 2.8 Fabrication
- 3.1 Preparation
- 3.2 Installation
- 3.3 Installation – Tolerances
- 3.4 Adjusting and Cleaning
- 3.5 Protection

### **1.3 SUMMARY**

- .1 The work of this Section includes architectural woodwork including, but not limited to, the following:
  - .1 Standing and running trim.
  - .2 Cabinetry and hardware.
  - .3 Plastic wood benches and fabrications.
  - .4 Solid surfacing countertops and fabrications.
  - .5 Wood wall panels.
  - .6 Factory and *Site* finishing of architectural woodwork.

## 1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
  - .1 Coordinate with other subcontractor's work for satisfactory and expeditious completion of the work of this Section. 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.
  - .2 Where woodwork is to be fitted to other construction, check actual dimension of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final *Shop Drawings*. Coordinate manufacturing schedule with construction progress to avoid delays in the *Work*.
  - .3 *Provide* forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the work of this Section and set in place. Instruct applicable *Subcontractors* as to their locations.
  - .4 *Provide* cut-outs for raceways, sleeves, grommets and other manufactured accessories which are required for the work of this Section.

## 1.5 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 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.

.4 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.

## 1.6 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .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.

## 1.7 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Manufacturers:
    - .1 The *Contractor* shall ensure that architectural woodwork is manufactured by a firm having a minimum of five years' experience on work of similar size and quality.
    - .2 The *Contractor* shall ensure that the manufacturer is a member in good standing of the Architectural Woodwork Institute or the Architectural Woodwork Manufacturers Association of Canada or the Woodwork Institute or equivalent membership acceptable to the Consultant.
    - .3 Fabricator solid surfacing: Fabrication to be performed by a solid surface manufacturer's certified fabricator. The *Contractor* shall submit the manufacturer's certification letter prepared by the solid surfacing manufacturer.
  - .2 Installers / applicators / erectors: Engage an installer who has successfully completed two architectural woodwork projects similar in scope, materials and design to this *Project* within the last five years.
- .2 Quality standard:
  - .1 The 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.

## 1.8 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 subsection 1.10 - Field Conditions.

- .3 The *Contractor* shall be solely 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. The *Contractor* shall coordinate the delivery of the woodwork with the architectural woodwork manufacturer.

## 1.9 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 for woodwork. Note that building humidity control is not in operation 24 hours per *Day* or 365 *Days* per year and system is intermittent during winter and summer months. As a result, fabrication of wood components should anticipate major changes in humidity levels.

## PART 2 – PRODUCTS

### 2.1 PERFORMANCE/DESIGN REQUIREMENTS

- .1 Casework integrity shall meet the minimum acceptance levels in accordance with SEF 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.
- .3 Welding:
  - .1 Weld components in steel to conform to requirements of CSA W59-15, and by a fabricator fully certified by the Canadian Welding Bureau or equivalent certification acceptable to the *Consultant* in accordance with the conditions of CSA W47.1-09(2014) and CSA W55.3-08 (R2013) as applicable.
  - .2 Weld components in aluminum to conform to the requirements of CSA W59.2-M1991 (R2013), and by a fabricator certified by the Canadian Welding Bureau or equivalent certification acceptable to the *Consultant* in accordance with the conditions of CSA W47.2-12.
  - .3 Weld stainless steel components to conform to requirements of CSA W59-15 and ANSI/AWS D1.6/D1.6M as applicable, and by a fabricator fully certified by the Canadian Welding Bureau or equivalent certification acceptable to the *Consultant* in accordance with the conditions of CSA W47.1-09(2014).

### 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%.

### .3 Solid hardwood painted finish.

#### .1 Species:

- .1 White Birch.

#### .2 Cut:

- .1 Rift.

### .2 Wood veneers:

- .1 Allowable wood veneer face grade characteristics shall comply with Architectural Woodwork Standards, Edition 2, 2014 referenced grade and referenced standards.

#### .1 For applications other than Doors

##### .1 Species

- .1 White Birch.

##### .2 Veneer cut:

- .1 Rotary.

##### .3 Veneer leaf matching:

- .1 Random.

#### .2 For Doors

##### .1 Species

- .1 White Oak.

##### .2 Veneer cut:

- .1 Plain/Flat.

##### .3 Veneer leaf matching:

- .1 Book.

- .2 Edgeband exposed panel edges with 6 mm (1/4") thick solid hardwood trim, unless otherwise indicated in the Contract Documents.

### .3 Medium density fibreboard (TFL):



- .1 In accordance with ANSI A208.2-2009, 720 kg/m<sup>3</sup> (45 lbs/ft<sup>3</sup>) minimum density and as follows:
  - .1 Grade:
    - .1 Grade 130.
  - .2 Formaldehyde emission: F21 for panel thicknesses greater than 8mm 8 mm (5/16") and F13 for panels equal to or thinner than 8 mm (5/16").
  - .3 Acceptable *Products*:
    - .1 Uniboard Canada Inc.
      - .1 Finish: Riva - H52.
    - .2 Or *Equivalent*.

## 2.4 PANEL MATERIALS

- .1 Panel material schedule; except where indicated otherwise in the *Contract Documents*:
  - .1 Thickness: 19 mm (3/4") minimum.
  - .2 Core panels:
    - .1 At veneered work: MDF, except at shelving use veneer core plywood.
    - .2 Plywood backing; countertops, backsplashes, and where indicated in the contract drawings: Veneer core plywood with Type II adhesive, sanded good one side or good two sides (when both sides exposed or to receive applied finish materials) plywood, with no added urea-formaldehyde used in composition.
  - .3 Maximum moisture content at time of installation: 10% to 12%.
- .2 Plywood:
  - .1 Veneer core plywood non telegraphing grain:
    - .1 Softwood plywood: in accordance with ANSI/HPVA HP-1-2009.
    - .2 Douglas Fir plywood: in accordance with US Plywood Standard APA PS-1-09.
- .3 Medium density fibreboard (TFL):
  - .1 In accordance with ANSI A208.2-2009, 720 kg/m<sup>3</sup> (45 lbs/ft<sup>3</sup>) minimum density and as follows:
    - .1 Grade:
      - .1 Grade 130.
    - .2 Formaldehyde emission: F21 for panel thicknesses greater than 8mm 8 mm (5/16") and F13 for panels equal to or thinner than 8 mm (5/16").
    - .3 Acceptable *Products*:
      - .1 Uniboard.
        - .1 Finish: as noted in drawings.

.2 Or *Equivalent*.

.4 Engineered stone; quartz-based fabricated stone surfacing (SSUR(XX)):

.1 Refer to Section 12 36 61.

.5 Shower benches and boards for coat hooks:

.1 Accuspan (Solid Core); as manufactured by TruNorth Decking. or *Equivalent*, colour to later selection by the *Consultant* from the manufacturer's full range.

## 2.5 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 the *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 or *Equivalent*, Spaenaur Joint Connector bolt with decorative head, hex drive series; finish as selected by the *Consultant*.

.5 At butt joints in railing caps and counter surfaces, employ assembling bolts to ensure tight structural joint.

.6 Adhesives: Type II water resistant, except use Type I waterproof in wet environments.

## 2.6 HARDWARE

.1 Casework hardware: to be furnished and installed by the architectural woodwork manufacturer.

.1 As far as practical, use one manufacturer's products for all Products in this section.

.2 All costs associated with the *Products* of this Section will not be covered by a cash allowance and shall be included in the *Contract Price*.

.3 Cabinet and auxiliary hardware: Where casework hardware is not specified or indicated on the *Drawings* or scheduled, casework hardware shall comply with ANSI/BHMA Standards, latest edition, minimum grades, loading and other basic rules per the Architectural Woodwork Standards, Edition 1, 2009.

.4 All casework hinges and drawer slides shall be soft close type

.2 Wall panel and hardware: to be furnished and installed by the architectural woodwork manufacturer.

.1 Panel mounting system shall be aluminum French Cleat Hanging system – Z-Clips as manufactured by Extrude-A-Trim or equivalent.

.1 Rails – Aluminum “Z” Clip Extrusion for Hanging Panels - model FR0130, mill finish.

.2 Clips – Aluminum “Z” Clip Extrusion for Hanging Panels, 50mm pre-drilled lengths - model FR0130PC, mill finish.

.3 Stainless steel hat and coat hook: Specified under Section 10 28 00 – Washroom Accessories and Janitor Accessories for installation as part of the work of this Section.

## 2.7 FINISHES – INTERIOR ARCHITECTURAL WOODWORK

- .1 Paint and stain finish, in accordance with Section 09 91 00 - Painting.

## 2.8 FABRICATION

- .1 Fabricate woodwork to dimensions, profiles, and details indicated in the Contract drawings 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 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 *Provide* balancing sheets as required, and specified, complying with the Architectural Woodwork Standards, Edition 2, 2014.
- .8 *Provide* surface mount blocking and strapping necessary to support the work of this Section. Such blocking shall not be exposed upon completion of work.
- .9 Prefinish work at the factory, except where specified or indicated otherwise in the Contract documents.
- .10 Solid wood edging: No end grain shall be visible; mitre external corners; house internal corners.

## 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 Report conditions contrary to requirements preventing proper installation to the *Consultant*. 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 in the shop drawings.
- .5 Complete the finishing work specified in this Section to whatever extent not completed at shop or before installation of woodwork.
- .6 Plastic wood:
  - .1 Install plastic wood in accordance with manufacturer's instructions and recommendations.
  - .2 Install with the following minimum expansion/contraction gaps, wider as recommended by manufacturer:
    - .1 Width-to-width: 9.5 mm (3/8").
    - .2 End-to-end: 3.2 mm (1/8").
    - .3 Perimeter and abutting solid objects: 6.4 mm (1/4").
  - .3 Screw-down installation: Use manufacturer's recommended screws, exterior grade. Install screws at least 25 mm (1") in from board edges.

### 3.3 INSTALLATION – TOLERANCES

- .1 Install to a tolerance of 3 mm in 2400 mm (1/8" in 8'-0") for plumb and level (including tops) and with no variations in flushness of adjoining surfaces unless otherwise acceptable in accordance with the Architectural Woodwork Standards, Edition 1, 2009.

### 3.4 ADJUSTING AND CLEANING

- .1 Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair, replace woodwork, at the *Contractor's* expense.
- .2 Clean, lubricate, and adjust hardware.
- .3 Clean woodwork on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

### 3.5 PROTECTION

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

- .2 *Provide* final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that woodwork is without damage or deterioration at time of *Substantial Performance of the Work*.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

.1	PART 1 – GENERAL	1
.1	1.1 General Instructions	1
.2	1.2 SUMMARY	1
.3	1.3 REFERENCES	2
.4	1.4 ADMINISTRATIVE REQUIREMENTS	2
.5	1.5 SUBMITTALS	2
.6	1.6 QUALITY ASSURANCE	3
.2	PART 2 - PRODUCTS	3
.7	2.1 MANUFACTURERS	3
.8	2.2 COMPONENTS	3
.3	PART 3 - EXECUTION	5
.9	3.1 EXAMINATION	5
.10	3.2 PREPARATION	5
.11	3.3 INSTALLATION	5
.12	3.4 SITE QUALITY CONTROL	5

### **1.3 SUMMARY**

- .1 Section Includes: Provide thermal clips including but not limited to following:
- .1 sub-framing thermal spacers.
  - .2 spacer fasteners.
  - .3 cladding support sub-framing.
- .2 Related Sections: Following description of work is included for reference only and shall not be presumed complete:
- .1 Coordination with cast-in-concrete: Section 03 30 00, Cast-In-Place Concrete.
  - .2 Coordination with masonry construction: Section 04 20 00, Unit Masonry.
  - .3 Coordination with structural steel framing: Section 05 12 00, Structural Steel.
  - .4 Coordination with structural steel studs framing: Section 05 41 00, Structural Metal Stud Framing System.

- .5 Coordination with wood stud framing: Section 06 10 00, Rough Carpentry.
- .6 Coordination with building insulation: Section 07 21 00, Building Insulation.
- .7 Coordination with aluminum modular plate system: Section 07 42 43, Aluminum Modular Plate System.
- .8 Coordination with aluminum siding system: Section 07 46 16, Aluminum Siding System.
- .9 Coordination with metal siding system: Section 07 46 19, Metal Siding System.
- .10 Coordination with aluminum framed curtain wall system: Section 08 44 13, Glazed Aluminum Curtain Wall.

#### **1.4 REFERENCES**

- .1 Definitions:
  - .1 Rain Screen Principle: A theory governing the design of a building enclosure in such a way as to prevent water penetration due to rain; in other words, a scientific approach to eliminating water leakage.
- .2 Reference Standards:
  - .1 ASTM B117-19 - Standard Practice for Operating Salt Spray (Fog) Apparatus
  - .2 ASTM D570-98(18) - Standard Test Method for Water Absorption of Plastics
  - .3 ASTM D638-14 - Standard Test Method for Tensile Properties of Plastics
  - .4 ASTM D695-15 - Standard Test Method for Compressive Properties of Rigid Plastics
  - .5 ASTM D790-17 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
  - .6 ASTM D792-20 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
  - .7 ASTM G155-13 - Standard Practice for Operating Xenon Arch Light Apparatus for Exposure of Non-Metallic Materials

#### **1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Preinstallation Meetings: Arrange preinstallation meeting 1 week prior to commencing work with all parties associated with trade as designated in Contract Documents or as requested by Consultant. Presided over by Contractor [Construction Manager], include Consultant who may attend, Subcontractor performing work of this trade, Owner's representative, testing company's representative and consultants of applicable discipline. Review Contract Documents for work included under this trade and determine complete understanding of requirements and responsibilities relative to work included, storage and handling of materials, materials to be used, installation of materials, sequence and quality control, Project staffing, restrictions on areas of work and other matters affecting construction, to permit compliance with intent of work of this Section.

#### **1.6 SUBMITTALS**

- .1 Shop Drawings:

- .1 Submit Shop Drawings for work of this Section in accordance with Section 01 30 00. Ensure to include size, spacing and location of thermal clips.
- .2 Ensure a licensed engineer specified herein is responsible for:
  - .1 production and review of Shop Drawings.
  - .2 sealing and signing each Shop Drawing and any associated calculations performed.
- .2 Certificates: Submit in accordance with Section [01 30 00] [01 33 23]. Submit thermal clip manufacturer's written certification that Products, systems and assemblies have been installed in accordance with manufacturer's requirements.

## **1.7 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installers: Provide work of this Section executed by competent installers with minimum 5 years experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.
  - .2 Licensed Professionals: Employ a licensed engineer carrying [minimum \$2,000,000.00] professional liability insurance and is registered in the Province of Ontario.
- .2 Mock-Ups: Construct minimum 10 m<sup>2</sup> (100 sq ft) mock-up sample at Project location designated by Consultant for review. Once reviewed with no objections recorded, sample remains part of finished work and used as a quality reference standard for balance of Project.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- .1 Manufacturer List: Products of following manufacturers are permitted subject to conformance to requirements of Drawings, Schedules and Specifications:
  - .1 Cascadia Windows Ltd., Cascadia Clip®; [www.cascadiaclip.com](http://www.cascadiaclip.com)
  - .2 Or equivalent

### **2.2 COMPONENTS**

- .1 Performance/Design Criteria:
  - .1 Provide thermal spacers that meet or exceed following physical properties when tested in accordance with standards specified herein:
    - .1 Tensile Strength and Modulus: Minimum 411 MPa (59,600 psi) tensile and 169 MPa (24,500 ksi) modulus when tested to ASTM D638.
    - .2 Flexural Strength and Modulus:
      - .1 Lengthwise Control: Minimum 441 MPa (64,000 psi) flexural and 13 MPa (1,900 ksi) modulus when tested to ASTM D790.
      - .2 Crosswise Control: Minimum 127 MPa (18,400 psi) flexural and 8 MPa (1,200 ksi) modulus when tested to ASTM D790.
  - .3 Compressive Strength:
    - .1 Lengthwise: Minimum 205 MPa (29,800 psi) when tested to ASTM D695.



- .2 Crosswise: Minimum 83 MPa (12,000 psi) when tested to ASTM D695.
- .4 Water Absorption: Maximum 0.09% when tested to ASTM D570.
- .5 Density and Specific Gravity: Maximum 0.067 lbs/cu in density and 1.854 sp.gr 23/23° specific gravity when tested to ASTM D792.
- .6 Accelerated Weathering: No cracking, checking, crazing, erosion or other characteristics that might affect performance after 2000 hours of accelerated weathering when tested to ASTM G155.
- .7 Salt Spray: No cracking, checking, crazing, erosion or other characteristics that might affect performance after 3000 hours of salt spray exposure when tested to ASTM B117.
- .2 Structural Design: Employ a licensed engineer specified herein to:
  - .1 design components for work of this Section requiring structural performance.
  - .2 be responsible for determining sizes, yield strengths, gauge thicknesses and joint spacing to allow thermal movement and loading of components in accordance with applicable codes and regulations.
- .2 Sub-Framing Thermal Spacer: 100% Pultruded glass fibre and thermoset polyester resin insulation clip.
  - .1 Thermal Spacer thickness for top, base and web: 4.8 mm (3/16") nominal.
  - .2 Thermal Spacer Depth: [51 mm (2")] [64 mm (2-1/2")] [75 mm (3")] [89 mm (3-1/2")] [102 mm (4")] [127 mm (5")] [152 mm (6")] [203 mm (8")] nominal.
    - .1 Depth Tolerance: +/-0.127 mm (+/-0.005").
  - .3 Basis of Design: "Cascadia Clip®" by Cascadia Windows Ltd.
- .3 Spacer Fasteners: High hex head washer head with sharp twin threaded design of heat-treated corrosion resistant coated steel.

*SPEC NOTE: For steel framing choose 102 mm long screw fasteners for 51 mm and 64 mm clip, 127 mm long screw fastener for 89 mm and 102 mm clip, 152 mm long screw fastener for 102 mm clip, 178 mm long screw fastener for 127 mm clip, 203 mm long screw fastener for 152 mm clip, 254 mm fastener for 203 mm Clip. Note fasteners up to 254 mm can be galvanized or stainless steel. Stainless Steel fasteners provide superior thermal performance particularly on Clips over 127 mm.*

- .1 Fastener for Steel Framing: 1/4 - 14 x [102 mm (4")] [127 mm (5")] [152 mm (6")] [177 mm (7")] [203 mm (8")] [254 mm (10")] long with hex head. Ensure fasteners are supplied by Cascadia Windows Ltd., minimum 38 mm (1-1/2") longer than clip depth to allow for sheathing and penetration on steel stud.
- .1 Permitted Product: "Master Driller™ No. 2 Mini Drill Point with NZF3000 coating" by Leland Industries Inc.

*SPEC NOTE: For wood framing choose 102 mm long screw fasteners for 51 mm and 64 mm clip, 127 mm long screw fasteners for 75 mm clip, 152 mm long screw fastener for 89 mm and 102 mm clip, 152 mm long screw fastener for 102 mm clip, 203 mm long screw fastener for 127 mm and 152 mm clip, or 254 mm long screw fastener for 203 mm clip.*

- .2 Fastener for Wood Framing: 1/4 - 14 x [102 mm (4")] [127 mm (5")] [152 mm (6")] [177 mm (7")] [203 mm (8")] [254 mm (10")] long with hex head. Ensure fasteners are supplied by Cascadia Windows Ltd., minimum 38 mm (1-1/2") longer than clip depth to allow for sheathing and penetration on wood stud.
- .1 Permitted Product: "Master Gripper™ with DT2000 or NZF3000 coating" by Leland Industries Inc.

*SPEC NOTE: For cast-in-place concrete and concrete masonry units choose 82 mm long screw fasteners for 51 mm clip, 92 mm long screw fasteners for 64 mm clip, 96 mm long screw fastener for 75 mm clip, 130 mm long screw fastener for 89 mm clip, 143 mm long screw fastener for 102 mm clip, 168 mm long screw fastener for 127 mm clip, 193 mm long screw fastener for 152 mm clip or 247 mm long screw fastener for 203 mm clip.*

- .3 Fastener for Cast-In-Place Concrete and Concrete Masonry Units: 1/4 - 14 concrete screw with hex head. Fasteners to be supplied by Cascadia, minimum 38 mm (1-1/2") longer than Clip depth to allow for sheathing and penetration into concrete or concrete masonry unit.
  - .1 Permitted Product: "Concrete Screw with DT2000 or NZF3000 coating" by Leland Industries Inc.
  - .2 Embedment Depth: 38 mm (1-1/2"), except when into hollow concrete masonry unit, not less than 25 mm (1").
- .4 Cladding Support Sub-Framing:
  - .1 Material Basis-of-Design: Minimum 1.214 mm (18 ga), 33 ksi, factory-punched sheet steel with fastener holes to match fibreglass thermal spacers.
  - .2 Corrosion Resistant Coating on Sub-Framing: Galvalume AZM 150 (AZ 50)
  - .3 Sub-Framing Profiles: As shown on design drawings. Typically, Z-profile for vertically oriented sub-framing and hat-profile for horizontally oriented sub-framing, and additionally as required by cladding manufacturer or cladding structural engineer.
    - .1 Typical Sub-Framing Depth: 25 mm (1").

## **PART 3 - EXECUTION**

### **3.1. EXAMINATION**

- .1 Verification of Conditions: Verify actual site dimensions and location of adjacent materials prior to commencing work. Notify Consultant in writing of any conditions which would be detrimental to the installation.
- .1 Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

### **3.2. PREPARATION**

*SPEC NOTE: Use following when sub-framing spacers are used in conjunction with a cast-in-place concrete or a concrete masonry unit substrate.*

- .1 Pre-drill concrete or concrete masonry unit substrate to 13 mm (1/2") deeper than anticipated embedment depth of fastener into substrate.
- .2 Use drill diameter approximately 1.6 mm (1/16") less than screw diameter in accordance with fastener manufacturer's written recommendations.

- .3 Sub-Framing: Ensure thermal spacer type is selected to accommodate orientation of vertical and horizontal sub-framing.

### **3.3. INSTALLATION**

- .1 Sub-framing Thermal Spacer Installation: Install thermal spacers in accordance with spacer manufacturer's written recommendations.

*SPEC NOTE: Verify spacing of sub-framing with structural engineer and ensure information below is coordinated with Section 05 41 00 - Structural Metal Stud Framing System or Section 09 22 16 - Non-Structural Metal Framing. If sub-framing and Z-girt spacing is already included in metal framing section, then delete options dealing with spacing.*

- .2 Thermal Spacer Installation:
  - .1 Clip thermal spacer to Z-girt and hat track [[at centres determined using Cascadia Clip Calculator <http://www.cascadiawindows.com/tools/cascadia-clip-calculator> [or as directed by [Cladding Engineer] [Consultant]].
  - .2 Installation sequence for spacers, sub-framing and insulation: See <https://www.cascadiawindows.com/products/cascadia-clip#installation> for sequencing

*SPEC NOTE: Use following paragraph only when sub-framing is being installed which has not been pre-punched by manufacturer to accept thermal insulation clips. Cascadia manufactures steel sub-framing which is pre-punched to accept Cascadia Clip fasteners. Refer to Section 05 41 00 - Structural Metal Stud Framing System or Section 09 22 16 - Non-Structural Metal Framing. Delete following paragraph if pre-punched metal sub-framing is specified.*

- .1 Pre-punch holes or pre-drill holes in Z-girts and tracks to accommodate fasteners.

### **3.4. SITE QUALITY CONTROL**

- .1 Site Tests and Inspections:
  - .1 Structural Inspection: Ensure a licensed engineer specified herein inspects work of this Section during erection/installation and submits sealed and signed Field Review Report within 5 Days of site visit.
  - .2 Non-Conforming Work: Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to satisfaction of Consultant at no cost to Owner.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 REFERENCE DOCUMENTS**

- .1 American Society for Testing and Materials (ASTM):
  - .1 ASTM D1227-95 (2007) Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing
  - .2 ASTM D4479-07 Standard Specification for Asphalt Roof Coatings - ;Asbestos-Free
  - .3 ASTM D4586-07 Standard Specification for Asphalt Roof Cement, Asbestos-Free
- .2 Canada Green Building Council (CaGBC):
  - .1 LEED Canada 2009 Rating System LEED Canada for New Construction and Major Renovations. LEED Canada for Core and Shell Development. Website: [www.cagbc.org](http://www.cagbc.org)

### **1.3 SUBMITTALS**

- .1 Comply with requirements of Division 01.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Provide two copies of most recent data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
  - .3 Provide two copies of MSDS for all products and indicate VOC content.

### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for [reuse] [and] [recycling] in accordance with Section 01 74 19 - Management and Disposal.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Emulsion Type Damp proofing Coating: Asphaltic, water-based emulsion damp proofing, asbestos free, designed for application to exterior side of below grade foundations and walls, containing no solvents in accordance with ASTM D1227 and as follows:
  - .1 Application Temperature: 10°C

- .2 Grade: [Spray Type III or II, Class 1] [Brush Type II, Class 1] [Trowel Type II, Class 1].
- .3 VOC Content: Maximum 30 g/L (less water and exempt solvents).
- .2 Cutback Type Damp proofing Coating: Asphaltic, solvent based damp proofing, asbestos free, designed for application to exterior side of below grade foundations and walls in accordance with [ASTM D4479] [ASTM D4586] and as follows:
  - .1 Application Temperature: 2°C
  - .2 Grade: [Spray Type I] [Brush Type I] [Trowel Type I, Class 1].
  - .3 VOC Content: maximum 250 g/l.

## **2.2 ACCESSORIES**

- .1 Joint Sealing Compound: as recommended by damp proofing manufacturer.
- .2 Primer: as recommended by damp proofing manufacturer.
- .3 Patching Compound: fibred mastic compound as recommended by damp proofing manufacturer.
- .4 Reinforcing fabric: asphalt coated fabric as recommended by damp proofing manufacturer.

## **PART 3 - EXECUTION**

### **3.1 PROTECTION**

- .1 Protect adjoining surfaces from soiling during application.

### **3.2 EXAMINATION**

- .1 Examine substrates and verify that surface smoothness, moisture emissions and other conditions affecting performance of materials specified in this Section complies with the damp proofing manufacturer's recommended substrate requirements.

### **3.3 PREPARATION**

- .1 Protect and mask adjoining exposed surfaces from being stained, spotted or coated with damp proofing; prevent damp proofing materials from entering or clogging weep holes, drains and perimeter drainage systems.
- .2 Seal exterior joints between foundation walls and footings, joints between concrete floor slab and foundation and around penetrations through damp proofing with sealing compound and reinforcing fabric before applying damp proofing.
- .3 Clean substrates, remove projections; fill voids and apply bond breakers (if required), and apply primer as recommended by damp proofing manufacturer

### **3.4 APPLICATION**

- .1 Apply damp proofing to provide a continuous, uniform coating to entire exterior faces of foundation walls from 50 mm below finish grade level to and including tops of foundation wall footings:
  - .1 Do not permit damp proofing to extend onto surfaces exposed to view in final construction.
  - .2 Reinforce changes in direction greater than 45° at intersections, projecting surfaces, internal and external corners, changes in plane, and across construction joints, cracks and

- honeycombing; apply additional coat of damp proofing material to embed reinforcing fabric into primary damp proofing membrane; extend reinforcing fabric 200 mm to each side of areas requiring reinforcing.
- .3 Allow for additional coats to achieve required coating.
  - .4 Provide sufficient drying time between successive coatings.
  - .5 Provide drying time according to manufacturer's recommendations before backfilling. Allow for a range of ambient temperatures and humidity.
- .2 Use cutback asphalt materials at temperatures below 5°C.
  - .3 Use either cutback or emulsified asphalt materials, at Contractor's option, when surfaces and ambient air will be minimum 5°C for 72 hours before application, during application and for curing period.
  - .4 Seal holes around pipes and other services passing through dampproofed surfaces by using joint sealing compound applied in accordance with manufacturer's directions.

### **3.5 CLEANING**

- .1 Damp proofing materials shall be removed from surfaces not intended to receive damp proofing.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Administrative Requirements
- .5 1.5 Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Field Conditions
- .8 1.8 Delivery, Storage, and Handling
- .9 2.1 Performance/Design Requirements
- .10 2.2 Materials
- .11 3.1 General
- .12 3.2 Preparation - Typical
- .13 3.3 Membrane Installation
- .14 3.4 Field Quality Control

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Sheet waterproof membrane at locations as indicated and as follows:
    - .1 Throughwall membrane flashing: either Type 1 or Type 2 sheet membrane is acceptable.
    - .2 In shower compartments: only Type 1 sheet membrane is acceptable.
    - .3 Damp Proof Course (DPC): only Type 2 sheet membrane is acceptable.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Conduct a pre-installation meeting in accordance with Section 01 31 19 – Project Meetings.

### **1.5 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
  - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.

### **1.6 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 during a period of at least the immediate past 5 years, 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 the *Consultant*.

## 1.7 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.

## 1.8 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. Post "NO SMOKING" signs in areas where solvent-base materials are used and stored.
- .3 Store surface conditioner at temperature above 5°C.
- .4 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 Type 1:
  - .1 Standard ethylene propylene diene monomer (EPDM sheet membrane), in accordance with CGSB 37-GP-52M-1984, Type 1, Class A, 1.6 mm (1/16") thick, non-reinforced.



- .2 Waterproofing membrane Type 2:
  - .1 Self adhering polymeric waterproofing membrane.
  - .2 Thickness:
    - .1 Film: 4 mils.
    - .2 Polymeric membrane: 56 mils.
    - .3 Tensile strength: in accordance with ASTM D412-06a (2013).
    - .4 Film: 40.71 MPa (5,900 psi) minimum.
    - .5 Polymeric membrane: 4.07 MPa (590 psi) minimum.
    - .6 Elongation: in accordance with ASTM D412-06a (2013).
    - .7 Polymeric membrane: 455 percent minimum.
    - .8 Water vapour transmission: in accordance with ASTM E96/E96M-10, Method B: 0.05 grains/ft<sup>2</sup>/ hour.
    - .9 Water absorption: in accordance with ASTM D570-98(2010) e1, 0.1%, 72 hours maximum.
    - .10 Resistance to hydrostatic head: equivalent to 45.72 m (150 ft) of water.
    - .11 Puncture resistance: in accordance with ASTM E154/E154M-08a (2013) e1, 67 pounds.
    - .12 Acceptable *Products*:
      - .1 Bakor 'WP 200'.
      - .2 Colloid Environmental Technologies Company (CETCO) 'Envirosheet', as distributed by DRE Industries Inc.
      - .3 Tremco 'Permaquik PQ 7100'.
      - .4 Soprema 'Colphene 3000'.
      - .5 W.R. Meadows 'Mel-Roll'.
      - .6 Or Equivalent.
  - .3 Primer/surface conditioner: In accordance with membrane manufacturer's printed installation instructions.
  - .4 Adhesives: In accordance with membrane manufacturer's printed installation instructions.
  - .5 Mastic; self-adhered membrane systems: Single component, utility grade, rubber based sealant. Use manufacturer's proprietary mastic.
  - .6 Sealers:
    - .1 For sheet membrane Type 1: use sealant Type 6 in accordance with Section 07 92 00 – Joint Sealants in accordance with manufacturer's recommendations.
    - .2 For sheet membrane Type 2:
      - .1 With Blueskin WP200, use Polybitume 570-05, as manufactured by Bakor or *Equivalent*.

- .2 With Per-A-Barrier Wall Membrane, use Bituthene Mastic, as manufactured by Grace Construction Products or *Equivalent*.

## **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 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.
- .3 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.
- .4 Priming:
  - .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 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 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.
- .9 *Install* DPC across the width of the foundation wall and *Install* throughwall membrane flashing in masonry in accordance with the manufacturer's recommendations and as follows:
  - .1 *Install* membranes under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. *Install* membranes under weep hole courses as indicated.
  - .2 In cavity and veneered walls, carry throughwall membrane flashing from front edge of masonry, under outer wythe, then up backing not less than 250 mm (10") and as follows:
    - .1 For masonry backing, embed membrane a minimum of 25 mm (1") in joint of backing masonry.
    - .2 For frame backing, bond to plywood sheathing using manufacturer's recommended adhesive.
- .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 the *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.
  - .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 FIELD QUALITY CONTROL

- .1 Conduct quality control in accordance with Section 01 45 00. – Quality Control.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 2.1 Insulation Materials
- .7 2.2 Accessory Materials
- .8 3.1 General Installation Requirements
- .9 3.2 Examination
- .10 3.3 Installation – General
- .11 3.4 Installation – Batt Insulation
- .12 3.5 Installation – Semi-Rigid Insulation
- .13 3.6 Installation – Rigid Insulation Application
- .14 3.7 Installation – Foamed-in-Place Insulation
- .15 3.8 Field Quality Control
- .16 3.9 Protection

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Semi-rigid insulation; cavity walls.
  - .2 Rigid insulation; cavity wall insulation.
  - .3 Rigid insulation; below grade insulation at vertical conditions.
  - .4 Rigid insulation; below grade insulation at horizontal conditions.
  - .5 Foamed-in-place (gap filler) insulation.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
  - .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 the manufacturer's or independent laboratory indicating compatibility and adhesive results of proposed materials.
- .3 Samples: Submit representative samples of each specified insulation material, insulation clips, adhesives, fasteners, tapes and other material for review.

## 1.5 QUALITY ASSURANCE

- .1 Qualifications: 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 five years.

## PART 2 - PRODUCTS

### 2.1 INSULATION MATERIALS

- .1 Batt insulation; except where acoustic batt is indicated in the Contract Drawings.:
  - .1 Unfaced, mineral-fibre batts, in accordance with CAN/ULC S702-09, Type 1.
  - .2 Acceptable manufacturers:
    - .1 Fibrex.
    - .2 Johns Manville.
    - .3 Owens Corning Canada.
    - .4 Roxul Inc.
    - .5 Or *Equivalent*.
  - .2 Batt insulation; except where acoustic batt is indicated or scheduled:
    - .1 Unfaced, mineral-fibre batts, formaldehyde-free, in accordance with CAN/ULC S702-09, Type 1.
    - .2 Acceptable manufacturers:
      - .1 Johns Manville.
      - .2 Or *Equivalent*.
  - .3 Insulation Type 2: semi-rigid insulation, within cavity walls:
    - .1 Mineral-fibre in accordance with CAN/ULC S702-09, Type 1, 72 kg/m<sup>3</sup> (4.5 lb/ft<sup>3</sup>) minimum density in accordance with ASTM C612-10 for basalt rock and steel slag mineral-fibre insulation.
    - .2 Acceptable Products:
      - .1 Roxul 'CavityRock MD'.
      - .2 Or *Equivalent*.
  - .4 Insulation Type 3; rigid, below grade insulation at vertical conditions:
    - .1 Extruded polystyrene, closed-cell, smooth skin, in accordance with CAN/ULC S701-11, Type 4, 30 psi compressive strength.

- .2 Acceptable Products:
  - .1 'Styrofoam SM' as manufactured by Dow Chemical.
  - .2 'Celfort 300' as manufactured by Owens Corning.
  - .3 Or *Equivalent*.
- .5 Rigid insulation; below grade insulation at horizontal conditions:
  - .1 Extruded polystyrene, closed-cell, smooth skin, in accordance with CAN/ULC S701-11, Type 4.
  - .2 Compressive Strength, ASTM D1621-10, 275 kPa (40 psi) minimum (measured at 5% deformation or at yield, whichever occurs first).
  - .3 Acceptable *Products*:
    - .1 'Styrofoam Highload 40' as manufactured by Dow Chemical.
    - .2 'Foamular 400' as manufactured by Owens Corning Canada.
    - .3 Or *Equivalent*.
- .6 Foamed-in-place (gap filler) insulation:
  - .1 One-component CFC-free polyurethane foam in accordance with CAN/ULC S710.1-05.
  - .2 Two-component CFC-free polyurethane foam in accordance with CAN/ULC S711.1-05.

## 2.2 ACCESSORY MATERIALS

- .1 Adhesive: solvent based polymer modified liquid applied membrane, compatible with insulation to be applied, type as manufactured for the attachment of insulation. Acceptable *Product*: Bakor Airbloc 21 or 230-21 or *Equivalent*.
- .2 Insulation fasteners: Impaling clip of galvanized steel with washer retainer, to be adhered to surface to receive board insulation with adhesive, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- .3 Batt insulation restraint: Zinc coated woven wire and mechanical fasteners.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

- .1 Comply with requirements of Section 01 45 00 – Quality Control.
- .2 *Install* materials in accordance with manufacturer's installation instructions.

### 3.2 EXAMINATION

- .1 Take measurements at the *Place of the Work* to ensure that work is fabricated to fit structure; surrounding construction; around obstructions and projections in place, or as indicated in the Contract drawings; and to suit locations of services.
- .2 Verify that backup construction is aligned for proper installation of work before commencing erection.

### 3.3 INSTALLATION – GENERAL

- .1 Surfaces to receive insulation shall be dry and free of dew, frost, voids, loose material, oil, grease, asphalt curing compounds and other matter detrimental to bond of adhesive. Adhesive shall be compatible with waterproofing on walls.
- .2 Apply adhesives, and *Install* insulation in accordance with manufacturer's printed recommendations. Apply at rate as required to prevent displacement of insulation boards during construction operations.
- .3 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.
- .4 Apply insulation to ensure total and complete coverage of surfaces indicated in the Contract drawings to be insulated, and in direct contact with such surfaces. Unless otherwise specified, apply insulation in single layer of thickness indicated.
- .5 Ensure integrity and continuity of insulation at juncture with different types of materials and seal in an acceptable manner.
- .6 Do not enclose insulation until it has been reviewed and accepted by the *Consultant*.

### 3.4 INSTALLATION – BATT INSULATION

- .1 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .2 Do not over compress insulation to fit into spaces.
- .3 *Install* continuous woven wire restraint mechanically fastened to steel studs to hold insulation against exterior sheathing materials.
- .4 Insulation equal to that specified shall be placed in jamb and header assemblies that will be inaccessible after their installation into wall. Ensure that insulation is kept dry and not compressed.
  - .1 Where applicable, fasten insulation using masonry tie securement plates provided under Section 04 05 19 – Masonry Reinforcements and Connectors.
  - .2 In locations where insulation clips are not practical or available with masonry connectors, mechanically fasten insulation at maximum spacing of 400 mm (16") on centre, using fasteners to suit substrate condition.

### 3.5 INSTALLATION – SEMI-RIGID INSULATION

- .1 *Install* at masonry assembly locations in accordance with Section 04 05 00 – Masonry Procedures.
  - .1 Where applicable, fasten insulation using masonry tie securement plates provided under Section 04 05 19 - Masonry Reinforcements and Connectors.
  - .2 In locations where insulation clips are not practical or available with masonry connectors, mechanically fasten insulation at maximum spacing of 400 mm (16") on centre, using fasteners to suit substrate condition.

### 3.6 INSTALLATION – RIGID INSULATION APPLICATION

- .1 Edge butter rigid insulation joints with adhesive and trowel flush with insulation face at wall cavity insulation locations to *Provide* a full and continuous seal.

- .2 Butter masonry tie penetrations with adhesive at wall cavity insulation locations.
- .3 Secure rigid insulation boards to substrate at rate of 6 each 610 x 1220 mm (24" x 48") board minimum, with corrosion resistant mechanical fasteners complete with 25 mm (1") plastic washers.
- .4 Below grade insulation:
  - .1 Adhere rigid insulation to face of below grade perimeter walls with adhesive.
  - .2 Perimeter below grade application: extend boards minimum 600 mm (24") vertically below bottom of finish floor slab, installed on face of perimeter foundation walls.
- .5 Below grade insulation; underslab:
  - .1 *Install* in accordance with the insulation manufacturer's written specifications and in accordance with requirements of subsection 3.3 – General Installations of this Section.

### **3.7 INSTALLATION – FOAMED-IN-PLACE INSULATION**

- .1 *Install* one-component foam in accordance with CAN/ULC S710.2-05 application standard.
- .2 *Install* two-component foam in accordance with CAN/ULC S711.2-05 application standard.
- .3 *Install* at exterior building envelope assemblies to locations as indicated in the Contract drawings, to cavity and gaps surrounding metal frames.
- .4 Refer also to foamed-in-place insulation as specified in Section 08 41 00 – Aluminum Framed Glazing Systems.

### **3.8 FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.

### **3.9 PROTECTION**

- .1 Comply with the manufacturer's printed recommendations respecting protection.
- .2 Protect polystyrene insulation from extended exposure to sunlight.

**END OF SECTION**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 2.1 Sheet Vapour Barrier
- .7 2.2 Accessories
- .8 3.1 Installation
- .9 3.2 Attachment
- .10 3.3 Exterior Surface Openings
- .11 3.4 Perimeter Seals
- .12 3.5 Lap Joint Seals
- .13 3.6 Electrical Boxes
- .14 3.7 Field Quality Control

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Above-grade vapour barrier.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 sample of proposed *Products* for review by the *Consultant*.

### **1.5 QUALITY ASSURANCE**

- .1 Qualifications: *Provide* work of this Section, executed by competent installers with minimum five years' experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Mock-up:
  - .1 Construct 10 m<sup>2</sup> (100 ft<sup>2</sup>) area of typical installation for each type of *Product*.

- .1 Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.
- .2 Locate at the *Place of the Work* as part of final installation. Space installation to include exterior wall panel incorporating window and insulation.
- .3 Do not proceed until mock-up has been reviewed by the *Consultant*.
- .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

## **PART 2 - PRODUCTS**

### **2.1 SHEET VAPOUR BARRIER**

- .1 Polyethylene film: CAN/CGSB 51.34-M86 (amended 1988), Type 1, 0.15 mm (6 mil) thick, with a water vapour permeance of not greater than 45 ng/(P•s•m<sup>2</sup>), flame spread rating of less than 150 in accordance with CAN/ULC-S102-10.

### **2.2 ACCESSORIES**

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 75 mm (3") wide.
- .2 Lap sealant; butyl sealant: CGSB 19.21-M87.
  - .1 Acceptable *Products*:
    - .1 Pecora 'BA98'- Pecora Corporation
    - .2 Tremco 'Acoustical Sealant'.
    - .3 QuietSeal 'Acoustic Sealant QS-350'.
    - .4 Or *Equivalent*.
- .3 Staples and fasteners: minimum 6.4 mm (1/4") leg.
- .4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- .1 Ensure services are installed and inspected prior to installation of sheet vapour barrier.
- .2 *Install* sheet vapour barrier on interior side of insulation at exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous application.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect sheets for continuity. Repair punctures and tears with sealing tape before work is concealed.

### **3.2 ATTACHMENT**

- .1 Seal vertical joints in sheet vapour barrier over framing by lapping no fewer than two studs.
- .2 Fasten sheet vapour barrier to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 400 mm (16") o.c.

### 3.3 EXTERIOR SURFACE OPENINGS

- .1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

### 3.4 PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier as follows:
  - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
  - .2 Lap sheet over sealant and press into sealant bead.
  - .3 *Install* staples through lapped sheets at sealant bead into wood substrate.
  - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

### 3.5 LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier as follows:
  - .1 Attach first sheet to substrate.
  - .2 Apply continuous bead of sealant over solid backing at joint.
  - .3 Lap adjoining sheet minimum 150 mm (6") and press into sealant bead.
  - .4 *Install* fasteners through lapped sheets at sealant bead into wood substrate.
  - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

### 3.6 ELECTRICAL BOXES

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
  - .1 *Install* moulded box vapour barrier or double wrap boxes with film sheet providing minimum 305 mm (12") perimeter lap flange.
  - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

### 3.7 FIELD QUALITY CONTROL

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 2.1 Materials
- .7 3.1 Installation
- .8 3.2 Field Quality Control

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Below grade vapour barrier; located beneath concrete slabs.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 -Submittal Procedures.
- .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 the *Consultant*.

### **1.5 QUALITY ASSURANCE**

- .1 Qualifications: *Provide* work of this Section, executed by competent installers with minimum five years' 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)] in accordance with ASTM E1745-11 paragraphs 7.1.2 through 7.1.5.
    - .2 Strength: Class A in accordance with ASTM E1745-11.
    - .3 Thickness of plastic:

- .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 Or *Equivalent*.
- .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 the manufacturer's instructions.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- .1 *Install* vapour barrier membrane in accordance with the 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 Overlaps 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.

- .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 – Quality Control.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 References
- .5 1.5 Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Delivery, Storage, and Handling
- .8 1.8 Field Conditions
- .9 1.9 Extended Warranty
- .10 2.1 Performance/Design Requirements
- .11 2.2 Materials – General
- .12 2.3 Sheet-Applied, Vapour Impermeable Self-Adhesive Air / Vapour Barrier Membrane System
- .13 2.4 Sheet-Applied, Vapour Permeable Sheathing Membrane Air Barrier System
- .14 3.1 Installation – General
- .15 3.2 Installation – Sheet Applied, Vapour Impermeable, Self-Adhesive Membrane
- .16 3.3 Field Quality Control

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Air barrier membrane for masonry wall assemblies and for frame construction.
  - .2 Sheet-Applied Self-Adhesive Air / Vapour Barrier Membrane.

### **1.4 REFERENCES**

- .1 Definitions:
  - .1 Air barrier material: A building material that is designed and constructed to *Provide* primary resistance to airflow through air barrier system.
  - .2 Air barrier system: The collection of air barrier materials and auxiliary materials applied to substrate, including joints and junctions to abutting construction, to control air movement through the building envelope.

### **1.5 SUBMITTALS**

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

- .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.
- .3 Compatibility statement:
  - .1 Submit manufacturer's compatibility statement validating compatibility of air barrier system materials with substrates and adjacent materials.

## 1.6 QUALITY ASSURANCE

- .1 Qualifications: *Provide* the work of this Section, executed by competent installers with a minimum of five years' 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 the *Consultant*.

## 1.7 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.

## 1.8 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 the inspection and testing company, the manufacturer and the 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.

## 1.9 EXTENDED WARRANTY

- .1 The work of this Section shall meet the specified building envelope performance requirements during the warranty period.

## 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) in accordance with 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) in accordance with ASTM E283-04 (2012).
  - .3 Water vapour transmission for air / vapour barriers: Maximum 5.7 ng/Pa.s.m<sup>2</sup> (0.1 perms).
  - .4 Water vapour transmission for vapour permeable air vapour barriers: Minimum 570 ng/Pa.m<sup>2</sup> s. (10 perms).
  - .5 Air barrier membrane system structural performance while maintaining air barrier performance for air leakage: Air barrier system shall transfer wind loads to structure and shall resist 100% of design wind load in accordance with the Ontario 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: in accordance with ASTM D1970/D1970M-15.
- .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 Styrene-Butadiene-Styrene (SBS) modified asphalt for low temperature flexibility and polyethylene scrim reinforcing, with physical properties as follows:
  - .1 Single source responsibility: Components required for complete air barrier system and through wall flashing membrane behind the opaque wall assemblies to be obtained from single manufacturer.
  - .2 Thickness: 1.0 mm (40 mils)
  - .3 Application temperature: in accordance with *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:
    - .1 Henry Company 'Bakor 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 'Sopraseal Stick 1100 Summer Grade' and Sopraseal Stick 1100 Winter Grade'.
    - .6 Tremco 'ExoAir 110 and 110LT'.
    - .7 W.R. Meadows 'Air Shield' and 'Low Temperature Air Shield'.
    - .8 Or *Equivalent*.

## **2.4 SHEET-APPLIED, VAPOUR PERMEABLE SHEATHING MEMBRANE AIR BARRIER SYSTEM**

- .1 Description: Flexible sheet material with high vapour permeability in accordance with CAN/CGSB 51.32- M77, for breather type sheathing membranes.
- .2 Air barrier tape: as per manufacturer's printed installation instructions.
- .3 Fasteners:
  - .1 For steel frame construction: as per manufacturer's printed installation instructions, rust resistant screws with 50 mm (2") diameter plastic cap.
  - .2 For wood frame construction: as per manufacturer's printed installation instructions, nails with large heads or plastic washers. Wide staples with a 25 mm (1") minimum crown may be used if applied on wood sheathing.
- .4 Acceptable *Products*:
  - .1 Dupont 'Tyvek CommercialWrap'.
  - .2 Fabrene Inc. 'Air-Gard XL'.

- .3 Dow 'Styrofoam WeatherMate Plus'.
- .4 Fiberweb 'Tygar Metrowrap'.
- .5 Or *Equivalent*.

### **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 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 the work of this Section with air / vapour barrier membrane in Section 08 41 00 – Aluminum Framed Glazing Systems Door Hardware.

#### **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 the manufacturer's recommendations. 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 *Day's* 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 in the Contract Drawings, or required by the manufacturer's installation instructions.
- .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 FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.
- .1 Perform pull adhesion tests for project substrates in accordance with ASTM D4541-09e1.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 2.1 Materials
- .5 3.1 Workmanship
- .6 3.2 General Erection Tolerances

### **1.3 SUMMARY**

- .1 .2 Related Work
  - .1 .1 Section 04051 Masonry Procedures
  - .2 .2 Section 06100 Rough Carpentry
  - .3 .3 Section 07212 Rigid Insulation
  - .4 .4 Section 07213 Batt and Blanket Insulation
  - .5 .5 Section 07531 Ethylene Propylene Diene Monomer (EPDM) Roofing and Waterproofing.
  - .6 .6 Section 07620 Metal Flashing and Trim
  - .7 .7 Section 07900 Joint Sealers
- .2 .3 Shop Drawings
  - .1 .1 Submit shop drawings in accordance with Section 01300 Submittals.
  - .2 .2 Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.
- .3 .4 Qualifications
  - .1 .1 The work of this section shall be performed by a member in good standing of the Canadian Roofing Contractors Association who shall also:
    - .1 .1 Have a minimum of 5 years' proven satisfactory experience.
    - .2 .2 Have adequate equipment and skilled personnel to complete this work in an efficient and workmanlike manner.
- .4 .5 Guarantee / Warranty
  - .1 .1 This Contractor shall, and hereby does, warrant, and the General Contractor does guarantee, that the metal panels and related closures, fixings, and the like, supplied and installed under this section, shall be free from defects for a period of 1 (one) year. Defective work shall be corrected expeditiously and at no expense to the Owner.

- .2 .2 Furnish said Guarantee/Warranty in writing on a form acceptable to the Consultant, signed and countersigned by the General Contractor and Sub-Contractor.
- .3 .3 Guarantee/Warranty period shall commence from the date of issuance of the Final Certificate of Acceptance of the Building.
- .5 .6 Inspection
- .1 .1 All roofing and sheet metal work shall be done under the supervision of the Independent Inspection and Testing Company. Work shall not be considered complete until a certificate is issued by the Inspection Company.
- .2 .2 Notify the Independent Inspection and Testing Company at least 48 hours prior to starting the work.
- .3 .3 The cost for this inspection shall be part of the Cash Allowance provided under Appendix "A" – Itemized Prices of the Quotation Request.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

#### **.1 Prefinished Metal Cladding and Canopy Soffit**

- .1 .1 Prefinished sheet steel to CSSBI Bulletin B16-94 Prefinished Sheet Steel for Building Construction.
- .2 .2 Base Metal: galvanized sheet steel to ASTM A446, grade A zinc coat Z275, nominal thickness of 0.76 mm.
- .3 .3 Profiles:
  - .4 .1 **AD300R**, as manufactured by VicWest Steel, for exterior wall cladding and canopy soffit where indicated.
  - .5 .2 **L-800R**, as manufactured by VicWest Steel, for the liner as indicated.
- .6 .4 Colours:
  - .1 .1 QC 6068 HMP Black from manufacturer's standard colours.
  - .2 .2 QC 6086 HMP Bright White from manufacturer's extended inventory colours.

#### **.2 Metal Flashing and Trim**

- .6 .1 Form all metal flashings, cap flashings, cant flashings, copings, and fascias, to profiles indicated of same prefinished sheet metal as cladding and soffits, colour to match adjacent material unless indicated otherwise.
- .7 .2 Exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and window/door trim of same material, colour and finish as cladding, with fastener holes pre-punched.

#### **.3 Accessories**

- .8 .1 Isolation coating: alkali resistant bituminous paint.
  - .1 .2 Plastic cement: to CGSB 37-GP-5M89.
  - .2 .3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

- .3 .4 Cleats: of same material and temper as sheet metal, minimum 50 mm wide. Thickness and colour to be same as the sheet metal being secured.
- .4 .5 Nails: to CSA B111, 16 ga, of sufficient length to adequately secure work in place and have a head of at least 12.7 mm dia. Material shall be compatible with sheet metal being secured.
- .5 .6 Screws, Bolts, Expansion Shields: to ANSI B18.6.4 of metal compatible with adjacent surfaces. Exposed fastenings shall be made of the same material as the metal surface on which they occur.
- .6 .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

#### **.4 Sealant**

- .7 .1 Type 1 (see Section 07900 Joint Sealers) with primer and backer rods as recommended by manufacturer.

### **PART 3- EXECUTION**

#### **3.1 INSTALLATION OF METAL CLADDING AND CANOPY SOFFIT**

- .9 .1 Install cladding in accordance with CGSB 93-GP-5M, and manufacturer's written instructions
- .10 .2 Work shall be done as shown on the drawings to provide a neat, plumb and square installation.
- .11 .3 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated.
- .12 .4 Install outside corners, fillers and closure strips with carefully formed and profiled work.
- .13 .5 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.
- .14 .6 Attach components in manner not restricting thermal movement. S-lock seams shall be used for joints, shall permit thermal movement and shall be fitted with caulking compound. Space joints on fascias evenly. Dovetail and mitre all corners. Make joints square, plumb, straight and true.
- .15 .7 Caulk junctions with adjoining work with sealant.

#### **3.2 .2 INSTALLATION OF METAL FLASHING AND TRIM**

- .16 .1 Install sheet metal work as detailed. Do not cover felt flashings or roofing materials with sheet metal until inspected and approved.
- .17 .2 Sheet metal work required over all roofing membrane flashings, roof curbs, equipment support curbs, wall flashings, fascia boards, and miscellaneous trim around roof edges, and as indicated.
- .18 .3 Make allowance for thermal movement when forming and installing interlocking sheet metal work to avoid buckling fullness of metal and straining of joints or seams.
- .19 .4 Double-back exposed edges at least 12 mm for appearance and stiffness.

- .20 .5 Provide continuous starter strips to present a true, non-waving leading edge. Anchor back-up in approved manner to provide rigid, secure, permanent installation. Stagger joints with flashing joints.
- .21 .6 Use concealed fastenings except where approved before installation.
- .22 .7 Provide underlay under all sheet metal installed directly over masonry, concrete, or construction grade wood, and elsewhere as necessary to prevent electrolysis. Lay the underlay as sheet metal work is installed. Secure in place and lap joints 100 mm.
- .23 .8 S-lock seams shall be used for joints, shall permit thermal movement, and shall be filled with sealant. Space exposed joints of flashings uniformly. Dovetail and mitre all corners. make joints square, plumb, straight and true.
- .24 .9 Lock end joints and caulk with sealant.

### **3.3 .3 CLEANING OF THE WORK**

- .25 .1 On completion of the Work, remove all bitumen or foreign matter from metal cladding, and wash with soap and hot water, or a suitable washing powder, rinse with cold water and wipe dry with a clean cloth. Leave work in a first class condition to the satisfaction of the Consultant.
- .26 .2 Remove excess materials form the site.

**END OF SECTION**

**PART 1 – GENERAL****1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

**1.2 SECTION INCLUDES**

- 1.1 General Instructions
- 1.2 Section Includes
- 1.3 Summary
- 1.4 Administrative Requirements
- 1.5 Submittals
- 1.6 Closeout Submittals
- 1.7 Quality Assurance
- 1.8 Delivery, Storage, and Handling
- 1.9 Field Conditions
- 1.10 Extended Warranty
- 2.1 Roofing System Manufacturer
- 2.2 Performance/Design Requirements – General
- 2.3 Performance/Design Requirements – Fire Protection
- 2.4 Roofing Membrane and Flashing Sheets
- 2.5 Auxiliary Roofing Membrane Materials
- 2.6 Asphalt Materials
- 2.7 Substrate Boards
- 2.8 Air and Vapour Barriers
- 2.9 Roof Insulation
- 2.10 Insulation Accessories
- 2.11 Fasteners and Restraints
- 2.12 Walkway Pavers
- 2.13 Expansion Joints
- 2.14 Flashings and Penetration Flashings
- 3.1 Examination
- 3.2 Preparation
- 3.3 Method of Installation
- 3.4 Substrate Board (Sheathing/Underlay)
- 3.5 Application of Primer
- 3.6 Air and Vapour Barrier
- 3.7 Asphalt Application
- 3.8 Insulation Application – Conventional Roofing
- 3.9 Cover Board
- 3.10 Installation of Reinforced Gussets



- 3.11 Roofing Details
- 3.12 Installation of Torch-Applied Cap Sheet Membrane
- 3.13 Installation of Torch-Applied Cap Sheet Flashing Membrane
- 3.14 Waterproof Expansion Joint Installation
- 3.15 Roof Drains
- 3.16 Roof Penetrations
- 3.17 Metal Flashings
- 3.18 Paver Installation
- 3.19 Field Quality Control
- 3.20 Adjusting and Cleaning

### 1.3 SUMMARY

- 1. Section includes:
  - .1 Two-ply styrene-butadiene-styrene (SBS) modified bituminous membrane roofing; as follows:
    - .1 Exposed membrane roofing system.
    - .2 Roofing insulation.
    - .3 Air and vapour barrier.
    - .4 Associated roofing accessories and *Products*.

### 1.4 ADMINISTRATIVE REQUIREMENTS

- 1. Coordination:
  - 1. Coordinate with Divisions 21, 22 and 23 to ensure that roof drains are suitable for roofing system design.
  - .1 Coordinate with *Subcontractors* of roof mounted items, equipment, and mechanical and electrical work at roof so that installation will not subvert the integrity of the roofing system.
  - .2 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.
  - .3 The *Contractor* shall ensure that the manufacturer meets with the necessary parties at the *Site* to review and discuss *Project* conditions as it relates to the integrity of the roofing assembly.

### 1.5 SUBMITTALS

- 1. Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 *Product* data sheets:
    - 1. Submit manufacturer's *Product* data sheets for each type of *Product* indicated in the Shop Drawings.
  - .2 *Shop Drawings*; general details:

1. Include plans, elevations, sections, details, and attachments to other work for the following:
  1. Base flashings, cants, and membrane terminations.
  - .1 Tapered insulation, including slopes.
  - .2 Crickets, saddles, and tapered edge strips, including slopes.
  - .3 Insulation fastening patterns.
- .3 Certificates:
  1. Installer certificates: The *Contractor* shall *Provide* installer certificates signed by the roofing system manufacturer certifying that installer is approved, authorized, or licensed by manufacturer to *Install* roofing system.
  - .1 Manufacturer certificates: The *Contractor* shall *Provide* manufacturer certificates signed by the roofing manufacturer certifying that roofing system complies with requirements specified in subsection 2.2 - Performance/Design Requirements– of this Section.
    1. Submit evidence of compliance with performance requirements.
- .4 Roofing manufacturer's warranty and design criteria:
  1. Submit copy of completed roofing manufacturer's pre-installation notification form at least 10 *Working Days* prior to commencement of roofing installation.
  - .1 Submit copy of roofing manufacturer's warranty specimen and warranty design criteria for roofing system prior to commencement of roofing installation.
- .5 Samples:
  1. Submit samples complete with the manufacturer's labels intact, of materials to be used for work of this Section prior to commencement of work. Allowing 5 working days for review and acceptance by the *Consultant* and roofing inspection company. Do not proceed with work until samples are accepted.

## 1.6 CLOSEOUT SUBMITTALS

1. Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .1 Operation and maintenance data:
  1. Submit manufacturer's maintenance instructions for incorporation into the operation and maintenance manuals.

## 1.7 QUALITY ASSURANCE

1. Qualifications:
  1. Manufacturers: Company specializing in manufacturing the *Products* specified in this Section, with a minimum of 10 years' experience.
  - .1 Installers / applicators / erectors: The *Contractor* shall *Provide* work of this Section, executed by competent installers with minimum five years' experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

1. The *Work* of this Section shall be installed by a *Subcontractor* that is a member in good standing of the Canadian Roofing Contractors Association (CRCA) and Ontario Industrial Roofing Contractors Association (OIRCA) or equivalent certificate acceptable to the *Consultant*, who has been a member for at least five years.
  - .1 The roofing *Subcontractor* must be approved by the membrane manufacturer for the warranty program specified. Submit *Subcontractor's* certification letter prepared by the membrane manufacturer.
  - .2 Execute work of this Section only under full time supervision of qualified *Subcontractor's Site* supervisor.
  - .3 Mock-up:
    1. Prepare a 10 m<sup>2</sup> (100 ft<sup>2</sup>) mock-up of the work of this Section. Incorporate materials and methods of fabrication and installation identical with project requirements.
    - .1 Install mock-up at roof area location directed by the *Consultant*. Retain accepted mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and workmanship.

## 1.8 DELIVERY, STORAGE, AND HANDLING

1. Deliver roofing materials to the *Site* in original containers with seals unbroken and labelled with the manufacturer's name, *Product* brand name and type, date of manufacture, and directions for storage.
  - .1 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.
  - .2 Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.
  - .3 Handle materials carefully to preclude damage. Follow manufacturer's written recommendations.
  - .4 Package materials and identify on attached labels the manufacturer, brand, contents, weight as applicable, and *Product* and specification numbers.
  - .5 Protect edges of roll goods from damage during handling, and store rolls on end to prevent flattening.
  - .6 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.
  - .7 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*.
  - .8 Protect edges and corners of precast concrete paving slabs to prevent damage.

## 1.9 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.

## 1.10 EXTENDED WARRANTY

1. *Provide* Ontario Industrial Roofing Contractors Association (OIRCA) two-year warranty for labour, materials, and workmanship.
- .1 Warrant work of this Section in accordance with Section 01 78 36 - Warranties for a period of two years from the date of Substantial Performance.
- .2 In addition, 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 warranty duration, 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. Include copy of required warranty with close out documentation.
- .1 Warranty shall cover entire cost of the repair(s) required to maintain dry and watertight roofing system during the full warranty duration.
- .2 Warranty shall include for labour, materials, and workmanship.
- .3 Warranty shall be non-prorated with no dollar limit (NDL) for duration of warranty.
- .4 10-year warranty duration from the date of Substantial Performance.

## PART 2- PRODUCTS

### 2.1 ROOFING SYSTEM MANUFACTURER

1. General:
  1. Single source responsibility: each roofing component to be by one manufacturer.
- .3 Acceptable roof system manufacturers: Subject to compliance with requirements, *Provide Products* by one of the following:
  1. Firestone Building Products.
- .1 GAF Materials Corporation.
- .2 IKO Industries.
- .3 Siplast.
- .4 Soprema.
- .5 Or Equivalent.

### 2.2 PERFORMANCE/DESIGN REQUIREMENTS – GENERAL

1. Roofing system: The roofing system shall include roofing system materials required to achieve roofing membrane manufacturer's warranty.
- .4 Roofing materials, components, and assemblies shall resist environmental and wind (uplift) loads, and effects of those loads in accordance with the Ontario Building Code.
- .5 General performance: Installed roofing system and base flashings shall withstand wind uplift pressures, thermally induced movement, and exposure to weather without failure due to defective

manufacture, fabrication, installation, or other defects in construction. Roofing system and base flashings shall remain watertight.

- .6 Material compatibility: *Provide* roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- .7 Roofing system: Prevent water from entering building and roofing assembly through roofing membrane.
- .8 Roofing system design:
  1. Roofing system assemblies shall have been successfully tested by a qualified testing agency to resist project roofing uplift pressures in accordance with the Ontario Building Code.
  - .1 Roofing system shall meet roofing system manufacturer's 145 kph (90 mph) wind speed requirements or equivalent FM Class 60 Windstorm Classification for wind uplift pressures, and to cladding design wind loads indicated in wind study report, as applicable.
- .9 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".
- .10 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) in accordance with ASTM E2178-13.
  - .1 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) in accordance with ASTM E283-04 (2012).
  - .2 Water vapour transmission for air / vapour barriers: Maximum 5.7 ng/Pa.m<sup>2</sup>.s. (0.1 perms).
  - .3 Pull-off strength of liquid or sheet applied membrane and laps: Cohesive or substrate failure permitted when tested to specified wind load. Air barrier system shall transfer wind load to structure and shall resist 100% of design wind load or minimum of 2.15 kPa (45 psf), whichever is greater.
  - .4 Low temperature flexibility: to -30°C (-22°F) in accordance with CGSB 37-GP-56M-1985.
- .11 Air barrier system shall be joined in an airtight and flexible manner to air barrier material of adjacent building envelope air barrier systems, allowing for relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between the following unless otherwise applicable:
  1. Walls and openings.
  - .1 Across construction, control, and expansion joints.
  - .2 Penetrations.
- .12 Solar Reflectance: roof shall have a minimum Solar Reflectance Index (SRI) of 78.

## 2.3 PERFORMANCE/DESIGN REQUIREMENTS – FIRE PROTECTION

1. At the end of each *Working Day*, use a heat detector gun or equipment as recommended by the membrane manufacturer to spot smouldering or concealed fire. Schedule the work to ensure workers are still on location at least two hours after torch application.
- .13 Never apply the torch directly to any wood surfaces. Conform with fire safety recommendations of the manufacturer and the CRCA.
- .14 Throughout roofing installation, maintain the *Place of the Work* in a clean condition and have one approved ABC fire extinguisher within 6 m of each roofing torch. Torches must never be placed near combustible or flammable *Products*.

## 2.4 ROOFING MEMBRANE AND FLASHING SHEETS

1. Roof membrane base sheet and base sheet flashing: CGSB 37.56, SBS-modified asphalt membrane sheet.
  1. Reinforcement:
    1. 180 gm/m2 non-woven polyester.
  - .1 Thickness:
    1. 3 mm (0.160") minimum.
- .15 Roofing membrane cap sheet and cap sheet flashing: CGSB 37.56, SBS-modified asphalt membrane sheet with non-woven polyester reinforced elastomeric bitumen, protected by coloured granules.
  1. Reinforcement:
    1. 180 gm/m2 non-woven polyester.
  - .1 Thickness:
    1. 4 mm (0.140") minimum.

## 2.5 AUXILIARY ROOFING MEMBRANE MATERIALS

1. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing system.
- .16 Mastic sealant: Polyisobutylene, plain or modified bitumen, non-hardening, non-migrating, non-skinning, and non-drying.
- .17 Metal flashing sheet: Metal flashing sheet is specified in Section 07 62 00 – Metal Flashing.
- .18 Miscellaneous accessories: *Provide* miscellaneous accessories recommended by roofing manufacturer.
- .19 Aggregate surfacing: gravel with no foreign material, ASTM D1863/D1863M- 05(2011) e1, water washed, dry, free of dirt and dust, hard, dry, clean, and graded in sizes from 9 mm to 12 mm.

## 2.6 ASPHALT MATERIALS

1. Asphalt primer: CGSB 37-GP-9Ma-1983.
- .20 Roofing asphalt: CAN/CSA A123.4-04, Type 2 or Type 3.

## 2.7 SUBSTRATE BOARDS

1. Substrate board: ASTM C1177/C1177M-08, glass-mat, water-resistant gypsum substrate, factory primed.
  1. Thickness:
    1. 12.7 mm (1/2").
- .1 Acceptable *Products*:
  1. Georgia Pacific 'Dens Deck Prime'.
- .1 Or Equivalent.

## 2.8 AIR AND VAPOUR BARRIERS

1. Glass fibre sheet: ASTM D2178/D2178M-15, Type IV, asphalt-impregnated, glass-fibre felt (to be used in conjunction with asphalt).
- .21 Aluminized bitumen sheet: Air / vapour barrier membrane shall be manufactured by coating an aluminum foil with oxidized bitumen. Water vapour resistance: 16 ng/Pa.s.m<sup>2</sup>. Both surfaces lightly sanded.
- .22 SBS modified bitumen membrane, reinforced with a fibreglass mat in conformance with Prefabricated membrane, complying with CGSB 37-GP-56M-1985.

## 2.9 ROOF INSULATION

1. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses required to meet the R-values indicated.
- .23 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 3, HCFC free, 138 kPa (20 psi) minimum compressive strength (at 10% deformation), CAN/ULC-S126-06, LTTR value in accordance with CAN/ULC S770-00.
- .1 Board size:
  1. 1220 mm x 1220 mm (4 ft x 4 ft).
- .2 Tapered insulation: *Provide* factory-tapered insulation boards fabricated to slope of 1:48 (1/4 inch per 12 inches) unless otherwise indicated.
- .3 *Provide* preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated in the shop drawings 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.

## 2.10 INSULATION ACCESSORIES

1. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with roofing assembly.

.24 Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate and acceptable to roofing manufacturer.

.25 Insulation adhesive:

1. Modified asphaltic insulation adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

.26 Cant strips:

1. Insulation cant strips; perlite: ASTM C728-13, perlite insulation board, cut to *Provide* 45 degree transition from horizontal to vertical surfaces.

.27 Cover board:

1. Cover board; cellulose fibreboard: Asphalt treated and coated fiberboard in accordance with CAN/ULC S706-02, 12.7 mm (1/2") thick.

.1 Thickness: 12.7 mm (1/2").

.28 Substrate joint tape: 150 mm (6") wide, coated, glass fibre.

## 2.11 FASTENERS AND RESTRAINTS

1. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing system.

.29 Factory-coated steel fasteners and plates complying with corrosion-resistance provisions in FM 4470, designed for fastening roofing components to substrate, tested by manufacturer for required pullout strength and wind uplift resistance, and acceptable to roofing manufacturer.

.30 Termination bars: Pre-punched aluminum bar 25 mm (1") wide x 1.5 mm (1/16") thick x 3048 mm (10 ft) long with 6.4 mm (1/4") x 9.5 mm (3/8") slotted holes on 200 mm (8") centres.

## 2.12 WALKWAY PAVERS

1. Precast paver slabs: CSA A231.1-14/A231.2-14, 610 mm (24") square x 45 mm (1-3/4") height, slip resistant textured finish, minimum 45 MPa (6526 psi) compressive strength, minimum 4.5 MPa (653 psi) (mean) flexural strength, minimum 4.5% (by mass) water absorption, maximum allowable average loss of mass of not greater than 50 g/m<sup>2</sup> (0.16 oz/ft<sup>2</sup>) after 28 cycles.

.31 Precast support pads: 25 mm (1") thick, extruded expanded polystyrene insulation, in accordance with CAN/ULC S701-11, Type 4, Class B, self-extinguishing, 35 psi at 5% deflection compressive strength, thermal conductivity (k) factor of 0.029 at 23.8 °C.

## 2.13 EXPANSION JOINTS

1. Description:

.1 Manufactured from a proprietary copolymer with internal polyester reinforcement, monolithic seam vulcanization.

1. Movement and fabrication: Tri-directional movement capability, joint waterproofing system shall be factory fabricated in one piece for the entire contiguous expansion joint or where length of joint exceeds manufacturer's shipping and handling



guidelines shall be lapped and vulcanized by manufacturer's mechanics on *Site*, repair of damaged materials shall be performed by manufacturer's mechanics.

- .1 Compatible with adhesives and membranes associated with expansion joint construction in accordance with manufacturer's installation instructions.
- .2 Warranted by manufacturer to cover full warranty duration specified in this Section.
- .3 Hydrostatic pressure limit: Working pressure in column of water shall perform under static limit not to exceed 10 m (33 ft).
- .2 Acceptable *Products*; to suit type of roofing assembly and movement design requirements:
  - 1. Situra Inc. 'RedLINE'.
  - .1 Situra Inc. 'FlamLINE'.
  - .2 Or Equivalent.

## **2.14 FLASHINGS AND PENETRATION FLASHINGS**

- .32 .1 Prefinished metal flashings in accordance with Section 07 62 00 – Metal Flashing.
- .33 .2 Roof drains; Stainless steel bolts, leader diameter size maximized to suit existing drain outflow pipe, deck clamps, stainless steel control flow insert, ballast guard, bitumen coated flanges, vandalproof hinged access gate (Allen-key operable) complete with drain seals:
  - .1 Drain body construction:
    - .1 Aluminum.
  - .2 Lexcor 'Flash-Tite Superdrains-FSD-FLAT,
  - .3 Thaler Metal Industries 'RD-FLAT'.
  - .4 Or Equivalent.
- .34 Prefabricated plastic pans; insulation filler and sealer; designed and provided for roof penetrating component in each case and for specified roofing system. Use gooseneck types for wiring and conduit.
  - .1 Lexcor 'Roof Protrusion Flashing'.
  - .2 Thaler Roofing Specialties 'Stack Jack Flashing'.
  - .3 Or Equivalent.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .35 Examine substrates, areas, and conditions, with roofing installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  - .1 Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
  - .2 Verify that blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

- .3 Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 23 – Steel Roof Decking.
- .4 Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- .36 Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing manufacturer's written instructions. Remove sharp projections.
- .37 Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

### 3.3 METHOD OF INSTALLATION

- .38 Prepare surfaces and complete waterproofing work in conformance with roofing manufacturer's printed installation instructions.
- .39 Install roofing elements on clean and dry surfaces, in conformance with manufacturer's instructions and recommendations.
- .40 Roofing work must be completed in a continuous fashion as surfaces are readied and weather conditions permit.
- .41 Seal seams that are not covered by a cap sheet membrane in the same *Day*. Do not install cap sheet when moisture is present at/in the base sheet seams.
- .42 Whenever membranes are torch-applied, a continuous and even bead of molten bitumen must be visible as the membrane is unrolled and torched.
- .43 Lay roofing membrane free from wrinkles, air pockets, fishmouths, tears, and prominent lap joints. Full bond cap sheet to base sheet. Seams shall be lapped and fully bonded.
- .44 Prior to installation of base sheet and cap sheet, allow sheet to relax after unrolling. Relax time to be as recommended by manufacturer based on concurrent ambient temperature.
- .45 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.
- .46 Complete roofing up to line of termination for each *Working Day*.

### 3.4 SUBSTRATE BOARD (SHEATHING/UNDERLAY)

- .47 Lay substrate board with tightly butted joints. Longitudinal joints must be at right angles to flute direction. Joints occurring along widths of board to be continuously supported on top flange of metal deck. Stagger end joints of adjacent board by 1/2 the board width.
- .48 Ensure substrate board is immediately protected with membrane.
- .49 Mechanical fasteners to penetrate top flutes only; by no less than 19 mm (3/4") and by no more than 25.4 mm (1"). Check underside of deck before installation to eliminate damaging existing conditions below deck.
- .50 Tape all seams in substrate board prior to the installation of the air / vapour barrier. Use 150 mm (6") wide strips of self-adhering base sheet to prevent leakage into the building.

### 3.5 APPLICATION OF PRIMER

- .51 Roofing substrates surfaces shall receive a coat of primer at a rate required by roofing manufacturer's printed installation instructions.
- .52 Surfaces to be primed must be free of rust, dust or any residue that may hinder adherence.
- .53 Cover primed surfaces with roofing membrane as soon as possible (same Day coverage for self-adhesive membranes).

### 3.6 AIR AND VAPOUR BARRIER

- .54 Built-up two-ply asphalt and fibreglass felt: Install two glass-fibre felt plies lapping each felt 483 mm (19 inches) over preceding felt. Embed each felt in a solid mopping of hot roofing asphalt. Glaze-coat completed surface with hot roofing asphalt. Apply hot roofing asphalt within plus or minus 14°C (25°F) of equiviscous temperature.
- .55 Completely seal air and vapour barrier at terminations, obstructions, and penetrations to prevent air movement into roofing.

### 3.7 ASPHALT APPLICATION

- .56 Asphalt Heating: Heat roofing asphalt and apply within plus or minus 14°C (25°F) of equiviscous temperature unless otherwise required by roofing system manufacturer. Do not raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 14°C (25°F) of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.
- .57 Apply asphalt at Equiviscous Temperature (EVT) and do not spread more than 1830 mm (6 ft) of hot asphalt in front of each roll and reduce distance accordingly during cold weather. Ensure hot asphalt in kettle is in constant use and circulation to avoid distillation.
- .58 Apply asphalt at minimum rate of 1.2 kg/m<sup>2</sup> (25 lb/100 ft<sup>2</sup>) and as specified herein for aggregate surfacing flood coat.

### 3.8 INSULATION APPLICATION – CONVENTIONAL ROOFING

- .59 Comply with up roofing manufacturer's written instructions for installing roof insulation.
- .60 Adhesively applied insulation: Install insulation adhesive in accordance with roofing manufacturer's installation instructions.
- .61 Mechanically fastened insulation: 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
- .62 Nailer strips: Mechanically fasten 90 mm (3-1/2") width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:
  - .1 4877 mm (16 ft) apart for roof slopes greater than 1:12 (1 inch per 12 inches) but less than 3:12 (3 inches per 12 inches).
  - .2 1220 mm (48") apart for roof slopes greater 3:12 (3 inches per 12 inches).
- .63 Stagger and offset vertical joints from preceding insulation boards, 305 mm (12").

- .64 Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- .65 Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.
- .66 Install only as much insulation as can be covered with membrane roofing in the same *Day*.
- .67 Install insulation boards with edges in moderate contact without forcing and fill gaps greater than 6 mm (1/4") with insulation.
- .68 Cut insulation to fit to blocking, upstands, and penetrations through roof; fill gaps greater than 6 mm (1/4") with insulation.
- .69 Reduce thickness of insulation at roof drains by 13 mm (1/2") for a distance of 610 mm (24") from centre drain.
- .70 Install tapered insulation under area of roofing to conform to slopes indicated.
  - .1 Apply insulation adhesive to underside and immediately bond tapered insulation to substrate.
  - .2 Apply hot roofing asphalt to underside and immediately bond tapered insulation to substrate.
- .71 Protect and keep insulation dry (in new condition). Do not install insulation which is not in dry condition.

### **3.9 COVER BOARD**

- .72 Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 300 mm (12") in each direction. Loosely butt cover boards together. Tape joints if required by roofing manufacturer.
  - .1 Apply insulation adhesive to underside and immediately bond cover board to substrate.
  - .2 Apply hot roofing asphalt to underside and immediately bond cover board to substrate.

### **3.10 INSTALLATION OF REINFORCED GUSSETS**

- .73 Install reinforcing gussets on inside and outside corners of base sheet flashing membrane.
  - .1 *Provide* self-adhesive base sheet flashing membrane gussets, adhered over base sheet membrane flashing into intersecting corner, with edges of gusset sealed with a bead of compatible mastic.

### **3.11 ROOFING DETAILS**

- .74 *Install* as indicated on the *Drawings* and with various roofing details illustrated in roofing manufacturer's printed installation instructions.

### **3.12 INSTALLATION OF TORCH-APPLIED CAP SHEET MEMBRANE**

- .75 Once base sheet, base sheet flashing, and stripping are applied and do not show defects, and installation has been reviewed by the roofing system manufacturer and the inspection and testing company, cap sheet can then be laid.
- .76 Cap sheet shall be unrolled starting from lowest point of roof. Cap sheet shall be rerolled from both ends prior to torching. Care must be taken to ensure alignment of first roll (parallel with edge of roof).

- .77 Cap sheet shall be torch welded on to base sheet membrane. During this application, both surfaces shall be simultaneously melted, forming an asphalt bead that shall be pushed out in front of cap sheet. Maintain a consistent 3 mm (1/8") wide asphalt bead at seams.
- .78 Avoid overheating.
- .79 Base sheet and cap sheet seams shall be staggered a minimum of 305 mm (12").
- .80 Overlap side laps by 75 mm (3") and end laps by 150 mm (6").
- .81 Make sure 2 membranes are properly welded without unwelded areas. Torch welding speed varies depending on weather. In cold conditions, it slows down, in warm and dry conditions, it speeds up.
- .82 After installation of cap sheet, check lap seams on cap sheet.

### **3.13 INSTALLATION OF TORCH-APPLIED CAP SHEET FLASHING MEMBRANE**

- .83 Cap sheet flashing shall be laid in strips one metre wide. Side laps shall be 75 mm (3") and shall be staggered a minimum of 100 mm (4") from cap sheet laps and base sheet laps, in order to avoid excessive thickness.
- .84 Draw parallel chalkline at termination line of cap sheet flashing at horizontal roof deck surface. Sink surface granules into bed of hot bitumen with torch and round-nosed trowel in area between chalk line and base of upstand or parapet, as well as over any granulated vertical surfaces to be overlapped.
- .85 Cap sheet flashing shall be torch welded directly on its base sheet, proceeding from bottom to top. Torch welding shall soften the two membranes and ensure a uniform weld, as described under "Cap Sheet Installation". When allowed by support, cap sheet top edge shall be nailed on 305 mm (12") centres.

### **3.14 WATERPROOF EXPANSION JOINT INSTALLATION**

- .86 .1 *Install* all components of the system in accordance with the manufacturer's printed instructions.
- .87 .2 The system is to be wholly encapsulated between the plies of the modified bitumen membrane in a roofing system.
- .88

### **3.15 ROOF DRAINS**

- .89 Ensure that roof drains are set to permit drainage, located at lowest possible location, and properly secured. Cut and slope insulation at each drain to form a sump and to accommodate flashing immediately surrounding drain. Review final locations with the *Consultant* prior to installation of drains.
- .90 Drain sumps to be *Provided* by the tapered insulation manufacturer.
- .91 Temporarily block drain pipes during application of membrane. Remove blocking when work is not in progress and after work of this Section is completed.
- .92 Carry membrane and insulation to edge of drain base and trim around drain opening. Top ply to be granulated cap sheet flashing to minimum 200 mm (8") from edge of drains.

- .93 Ensure that installation of drain and membrane is performed in accordance with recommendations of drain manufacturer.
- .94 Prime drain flange and allow to dry.
- .95 Embed first felt ply in a coat of waterproofing mastic and extend plies of felt into the drain opening of drains, and trim as required.
- .96 Fill void between drain body and roof insulation board/base structure support with two-component polyurethane foam insulation.

### 3.16 ROOF PENETRATIONS

- .97 *Install* curb flashings around ducts, pipes, structural steel, and other projections through membrane systems in conformance with manufacturer's written instruction and as detailed.
- .98 Install penetration flashing supplied under work of mechanical and under the work of this Section, in accordance with roofing manufacturer's installation instructions.
- .99 Prime metal flanges with primer and allow solvents to flash off prior to installation.
- .100 Remove poly film on areas to receive metal flashing. Set metal flange in full layer of waterproofing mastic to *Provide* positive bond and seal.
- .101 *Install* base ply to the base of the metal flashing staying short of curved metal section.
- .102 *Install* cap ply to the base ply flashing ensuring a full bond to the base ply and apply bead of waterproofing sealer at the termination point.

### 3.17 METAL FLASHINGS

- .103 *Install* metal flashings in accordance with Section 07 62 00 – Metal Flashing.

### 3.18 PAVER INSTALLATION

- .104 .1 Public area pavers:
  - .1 *Install* paver pedestals in accordance with manufacturer's recommended installation instructions.
  - .2 Paver installation:
    - .1 *Install* pavers in accordance with paver manufacturer's written instructions. Align the top cap joint spacers with paver edges. Level pavers in succeeding rows.
    - .2 *Install* pavers tightly butted into pedestals. Form minimum joint widths.
    - .3 Shim or adjust to level and as necessary to prevent rocking of pavers.
    - .4 Installation tolerances:
      - .1 Step in face alignment between paver faces: Plus or minus 1.5 mm (1/16").
      - .2 Jog in joint alignment between paver sections: Maximum 1.5 mm (1/16").
    - .5 Do not use pavers with chips, cracks, voids, stains, or other defects which might be exposed to view in the finished work.

- .6 Machine cut pavers as necessary to fit the conditions indicated. Joints shall be no wider than the typical paver to paver joint.

### **3.19 FIELD QUALITY CONTROL**

- .105 Conduct quality control in accordance with Section 01 45 00 – Quality Control and as follows:
  - .1 Inspection and testing:
    - .1 Prior to installation of cap sheet membrane, base sheet membrane installation shall be reviewed by manufacturer and inspection and testing company, who shall each submit field review reports to the *Consultant*.
    - .2 Independent inspection and testing company shall perform:
      - .1 Inspections and *Provide* inspection reports.
      - .2 Tests and *Provide* test reports:
      - .3 Core cuts (if requested).
- .106 Manufacturer's field review to be in accordance with Section 01 45 00 – Quality Control.

### **3.20 ADJUSTING AND CLEANING**

- .107 Remove applicator's equipment and debris as work progresses, and at completion of the work of this Section in accordance with Sections 01 77 00 – Contract Closeout Procedures and Submittals.
- .108 Remove bituminous markings from finished surfaces.
- .109 Repair or replace defaced or disfigured finishes caused as a result of the work of this Section.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

#### **.1 Preliminary requirements**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Requests for substitutions for *Products* specified or indicated will not be considered unless the request is in strict accordance with Section 01630 Product Substitution Procedures.

#### **.2 related sections**

- .1 Section 05123 Structural Steel and Open Web Steel Joists
- .2 Section 06100 Rough Carpentry
- .3 Section 07212 Rigid Insulation
- .4 Section 07465 Preformed Metal Cladding
- .5 Section 07620 Metal Flashing and Trim
- .6 Section 07900 Joint Sealers

#### **.3 submittals**

- .1 Submit all required submittals in accordance with Section 01330 Submittals.
- .2 Samples: submit duplicate 300 mm x 300 mm samples of each sheet metal material specified in order to verify colour match.
- .3 Shop drawings: indicate arrangement of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to structural frame. Include location and configuration of snow fences and ridge vents.

#### **.4 qualifications**

- .1 The work of this section shall be performed by a member in good standing of the Canadian Roofing Contractors Association who shall also:
  - .1 Have a minimum of five (5) years' proven satisfactory experience.
  - .2 Have adequate equipment and skilled personnel to complete the work in an efficient and workmanlike manner.

#### **.5 guarantee / warranty**

- .1 The *Subcontractor* for the work of this section shall, and hereby does, warrant, and the *Contractor* does guarantee, that the sheet metal panels, related closures, fixings, and the like, *Provided* as part of the work of this section shall be free from defects for a period of two (2) years from the date of *Substantial Performance of the Work*.
- .2 Furnish said guarantee/warranty in writing in a form acceptable to the *Consultant* and the *Owner*, signed and counter-signed by the *Contractor* and the *Subcontractor*.

#### **.6 inspection**



- .1 All roofing and sheet metal work shall be done under the supervision of the Independent Inspection and Testing Company. The *Work* shall not be considered complete until a certificate is issued by the Independent Inspection and Testing Company.
- .2 Notify the Independent Inspection and Testing Company at least 48 hours prior to commencement of roofing work.
- .3 The cost for this inspection shall be paid for as part of the cash allowance for Independent Inspection and Testing in accordance with Section 01210 Allowances.

## 1.2 PRODUCTS

- .1 prefinished sheet metal
  - .1 Prefinished sheet steel to CSSBI Bulletin B16-94 Prefinished Sheet Steel for Building Construction.
  - .2 Base metal: continuous hot-dipped galvanized sheet steel conforming to the requirements of ASTM A-653M, nominal thickness of 0.76 mm.
  - .3 Profile: Tradition 150 in 500 mm coverage, full-length of roof slope without transverse seams, as manufactured by VicWest Steel.
  - .4 Finish: to be selected from VicWest Signature - SMP Coated Metal Line
- .2 accessories
  - .1 Ice and water shield as recommended by the sheet metal manufacturer.
  - .2 Sealant: Type 1 in accordance with Section 07900 Joint Sealers with primer and backer rods as recommended by the sheet metal manufacturer.
  - .3 Fasteners: concealed type.
  - .4 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
  - .5 Ridge vents: as recommended by roofing manufacturer in locations indicated.
  - .6 Snow guards/fences: as recommended by roofing manufacturer in locations indicated or required.
- .3 fabrication
  - .1 Hem exposed edges on underside 12 mm, mitre and seal.
  - .2 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

## 1.3 EXECUTION

- .1 installation
  - .1 Install in accordance with manufacturer's recommendations.
  - .2 Work shall be done to provide a neat, plumb, and square installation.
  - .3 Ice and water shield to be applied over entire extend of low roof areas, installed shingle style.
  - .4 Apply sheet metal roofing beginning at eaves.
  - .5 Form side laps with stitch fastening using a continuous bead of sealant or butyl tape.

- .6 Flash roof penetrations with material matching roof panels and make watertight using a continuous bead of sealant or butyl tape.
- .7 Form valleys of sheets not exceeding 3000 mm in length. Lap joints 150 mm in direction of water flow. Extend valley sheet a minimum of 150 mm under roofing sheets. At valley line, double-fold valley and roofing sheets and make watertight using a continuous bead of sealant or butyl tape.
- .8 Panel ends to be folded and hooked into metal flashing in accordance with manufacturer's standard details and recommendations.
- .9 Attach components in a manner not restricting thermal movement.
- .10 No face fasteners are to be used at ridges, valleys, hips, eaves, or valley starter strips.
- .11 Additional blocking is required between joists or trusses in locations where snow fences are to be installed.
- .12 Fix purpose made closures to bottom edge of sheet metal roof.
- .2 cleaning of the work
  - .1 On completion of the work, remove all bitumen or foreign matter from metal roofing, and wash with soap and hot water, or a suitable washing powder, rinse with cold water and wipe dry with a clean cloth. Leave work in a first class condition to the satisfaction of the *Consultant*.
  - .2 Remove excess materials from the *Place of the Work*.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 1.6 Delivery, Storage, and Handling
- .7 2.1 Prefinished Aluminum Flashing
- .8 2.2 Prefinished Metal Finishes
- .9 2.3 Accessories
- .10 2.4 Fabrication
- .11 3.1 Flexible Flashing Underlayment Installation
- .12 3.2 Roof Flashing Installation
- .13 3.3 Installation of Roof Accessories
- .14 3.4 Installation Tolerances
- .15 3.5 Field Quality Control
- .16 3.6 Adjusting and Cleaning
- .17 3.7 Protection

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 *Supply* and installation of prefinished metal (aluminum) flashings.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Shop Drawings*:
  - .1 Submit *Shop Drawings* including the following:
    - .1 Plans, elevations, sections, and attachment details.
    - .2 Detail fabrication and installation layouts, expansion-joint locations, and key details. Distinguish between shop and field assembled work.
    - .3 Include identification of material, thickness, weight, and finish for each item and location in the *Work*.
    - .4 Include details for forming, including profiles, shapes, seams, and dimensions.

- .5 Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  - .6 Include details of termination points and assemblies.
  - .7 Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contracting from fixed points.
  - .8 Include details of roof penetrations flashing.
  - .9 Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter flashings as applicable.
  - .10 Include details of special conditions.
  - .11 Include details of connections to adjoining work.
- .3 Samples:
- .1 Submit full-size samples of each specified flashing material formed to detailed profile including corner, curb, cap, and parapet flashing, and coping including lock-joints and hold-down clips.
  - .2 Submit 2 - 50 mm x 50 mm (2" x 2") samples of each type of sheet metal material, colour and finish.

## 1.5 QUALITY ASSURANCE

- .1 Qualifications:
- .1 Installers / applicators / erectors: *Provide* work of this Section, executed by competent installers with a minimum of five years' experience in application of *Products*, systems and assemblies specified and with approval of *Product* manufacturers.
  - .1 The *Work* of this Section shall be installed by a *Subcontractor* that is a member in good standing of the Canadian Roofing Contractors Association (CRCA), Ontario Industrial Roofing Contractors Association (OIRCA) or equivalent association acceptable to the *Consultant*, who has been a member for at least five years.
  - .2 Sealant shall be applied by a *Subcontractor* of recognized standing, having - not less than five years of proven experience in this type of work, and who has the necessary equipment and skilled mechanics to carry out the work of this Section satisfactorily and can substantiate this to satisfaction of the *Consultant*.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Keep materials and equipment free from debris, ice, snow and contaminants. Allow air to circulate around metal components, sheets and break shapes.
- .2 Protect holes, and reglets from water and ice during freezing weather.

## PART 2- PRODUCTS

### 2.1 PREFINISHED ALUMINUM FLASHING

- .1 Aluminum flat sheet: Flat aluminum sheet in accordance with ASTM B209-14, to the following minimum thickness and alloy:
  - .1 Painting quality: 3003H14 or 3105H14 to ANSI H35.1/H35.1M-2013.

- .2 Minimum thickness:
  - .1 0.81 mm (0.032").

## 2.2 PREFINISHED METAL FINISHES

- .1 *Provide* the following finish to exposed prefinished metal (steel/aluminum as applicable):
  - .1 Type 1; Finish: factory prefinished CSSBI 10000 Series.
    - .1 10000 Series (Polyvinylidene Fluoride - PVDF) will not visibly (within 10 metres to the unaided naked eye) crack, chip, or peel (lose adhesion) for 35 years from date of application. This does not include minute fracturing that may occur during the normal fabrication process. 10000 Series (Polyvinylidene Fluoride - PVDF) will not chalk in excess of a number eight rating, in accordance with ASTM D4214-07(2015) method D659 at any time for 35 years from date of installation (35.5 yrs from application); will not change colour more than five (5.0) Hunter  $\Delta E$  units as determined by ASTM D2244-15.
  - .2 Colour to later selection by the *Consultant* from the manufacturer's full range.

## 2.3 ACCESSORIES

- .1 Isolation coating: in accordance with CAN/CGSB-1.108, bituminous type.
- .2 Sealants: in accordance with Section 07 92 00 – Joint Sealants, colour as selected by the *Consultant* from the manufacturer's full range.
- .3 Cleats: of matching metal to flashing material, continuous, and of greater thickness than flashing material. Joints in cleats shall not coincide with joints in perimeter edge metal. Allow a 12.7 mm (1/2") gap between pieces.
- .4 Fasteners:
  - .1 Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
  - .2 General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head:
    - .1 Exposed screws: 38 mm (1-1/2") long minimum at 450 mm (18") on centre maximum. Heads matching colour of sheet metal using plastic caps or factory-applied coating. *Provide* metal-backed EPDM washer under heads of exposed fasteners.
    - .2 Blind fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    - .3 Cleat fasteners: Corrosion-resistant barbed angular ring or screw shank nail; length to achieve approximately 32 mm (1-1/4") penetration into nailer; fasten at 150 mm (6") on centre.
  - .3 Fasteners for prefinished aluminum sheet: Aluminum or Series 300 stainless steel.
  - .4 Fasteners and plates to meet the requirements of Factory Mutual 4470 Standard for wind uplift and corrosion resistance.
- .5 Flexible flashing membrane; standard temperature grade for use at locations where membrane is protected by material with insulating properties:
  - .1 Description:

- .1 Thickness: 1 mm (40 mils) minimum.
- .2 Self-adhesive grade rubberized membrane backed by high density polyethylene.
- .3 Primer for substrate.
- .2 Acceptable *Products*:
  - .1 Bakor 'Blueskin Roof RF200'.
  - .2 Grace 'Ice & Water Shield'.
  - .3 Soprema 'LASTOBOND SHIELD'.
  - .4 Or *Equivalent*.

## 2.4 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) "Architectural Sheet Metal Manual (Seventh Edition) details and as indicated.
- .2 Form pieces in 3048 mm (10 ft) maximum lengths. Make allowance for expansion at joints.
- .3 Sealed joints: Form non-expansion but movable joints in metal to accommodate sealant.
- .4 Expansion provisions: Form expansion joints of intermeshing hooked flanges, not less than 25.4 mm (1") deep, filled with sealant concealed within joints.
  - .1 Joints that *Provide* expansion and contraction capabilities should be located near the corners within approximately 610 mm (24") from each direction of the corner measured from the interior side.
- .5 Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, and of greater thickness of metal being secured.
- .6 Hem exposed edges on underside 12.7 mm (1/2"). Mitre and seal corners with sealant.
- .7 At parapets, *Provide* 25.4 mm (1") minimum overlap between bottom of wood blocking or flashing anchorage support and edge of drip or termination of flashing.
- .8 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .9 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .10 *Provide* 25.4 mm (1") minimum overlap between bottom of wood blocking or flashing anchorage support and edge of drip or termination of flashing.

## PART 3 - EXECUTION

### 3.1 FLEXIBLE FLASHING UNDERLAYMENT INSTALLATION

- .1 Apply primer to concrete masonry and precast concrete substrates.
- .2 *Install* in a consecutive weatherboard method starting at bottom or base of wall and working up.
- .3 *Provide* minimum of 50 mm (2") side laps and 75 mm (3") end laps.

- .4 Cut to manageable lengths, position membrane for alignment, remove protective poly- film and firmly apply pressure to assure adhesion.
- .5 Eliminate wrinkles or gaps, roll entire membrane surface (including seams) with a counter top or "J-roller" to ensure full contact and adhesion.
- .6 Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the air barrier membrane and around the perimeter edge of membrane terminations.
- .7 Flashing membrane shall be applied in weatherboard fashion starting at bottom of base of wall and working up, in and around the full perimeter of openings, to *Provide* watertight protection and according to the following procedures:
  - .1 Apply the first strip horizontally immediately below the sill, cut it sufficiently long to extend past each side of the window, so that it projects even with the vertical jamb flashing to be applied later. Turn sill flashing up 50 mm (2") at ends of sill.
  - .2 Sill flashing shall overlap wall membrane. Overlap jamb at head flashing membrane in the same manner.

### 3.2 ROOF FLASHING INSTALLATION

- .1 *Install* sheet metal work in accordance with SMACNA's "Architectural Sheet Metal Manual (Seventh Edition)".
- .2 *Provide* watertight flashing installing capable of resisting specified uplift pressures in accordance with roofing specifications, thermally induced movement and exposure to weather.
- .3 *Provide* minimum 10% slope for drainage towards roof at parapet locations, with minimum 2% sloped to drain at remaining flashing locations.
- .4 *Provide* continuous cleats for attachment of flashings at exterior face of wall and cleats for interior face of wall.
- .5 *Provide* radius (3-piece) copings for curved wall condition unless otherwise indicated.
- .6 Prefabricate corner copings in 610 mm (24") x 610 mm (24") sections.
- .7 Concealed fastenings and cleats, from view except where exposed flashings are accepted by the *Consultant* prior to installation.
- .8 Flash joints using S-lock forming tight fit over hook strips/cleats; unless otherwise indicated.
- .9 *Install* surface mounted flared joint true and level, and caulk top of reglet with sealant at reglets.
- .10 Insert metal flashings to other materials and flashings to form weather-tight junction.
- .11 *Provide* prefinished metal flashing over equipment curbs which are covered with roofing membrane.
- .12 Turn top edge of flashing into recessed reglet or mortar joint where indicated, to minimum depth of 25 mm (1"). Wedge flashing securely into joint. Seal flashing at reglet and cap flashing with sealant.
- .13 Expansion provisions: *Provide* for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 3048 mm (10 ft) and *Provide* uniform joint spacing with no joints allowed within 610 mm (24") of corner or intersection. Where lapped expansion provisions cannot

be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 25.4 mm (1") deep, filled with sealant concealed within joints.

- .14 *Provide* vapour permeable synthetic building paper separation between galvanized steel and treated wood where applicable.
- .15 *Install* flexible flashing membrane in accordance with the manufacturer's printed installation instructions.

### **3.3 INSTALLATION OF ROOF ACCESSORIES**

- .1 Incorporate devices to which roofing and flashing may be secured.
- .2 *Install* work to ensure that roofing and flashings will be properly applied to maintain building envelope weather-tight.

### **3.4 INSTALLATION TOLERANCES**

- .1 Installation tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 6 mm in 6 m (1/4 inch in 20 feet) on slope and location lines as indicated and within 3.2 mm (1/8") offset of adjoining faces and of alignment of matching profiles.

### **3.5 FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.
  - .1 The work of this Section will be inspected and tested in conjunction with inspection and testing of roofing work.

### **3.6 ADJUSTING AND CLEANING**

- .1 Remove deposits, stains or protections and wash metals left unpainted and exposed to view as recommended by manufacturer of metal or paint finish.

### **3.7 PROTECTION**

- .1 The *Consultant* will advise the *Contractor* of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering.

**END OF SECTION**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 1.6 Delivery, Storage, and Handling
- .7 2.1 Materials
- .8 2.2 Cementitious Fireproofing (Wet-Mix)
- .9 3.1 Preparation
- .10 3.2 Application
- .11 3.3 Field Quality Control
- .12 3.4 Protection

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Sprayed fire-resistive materials.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
  - .1 Underwriters Laboratories of Canada Inc. (ULC) design number, brand names and descriptive catalogue data of *Products* to be used in the work of this Section.
  - .2 Include complete test report in cases where references are not published by testing laboratories, and where the *Authority Having Jurisdiction* has approved significant changes from tested assembly on basis of an engineering study; study calculations shall accompany report.

### **1.5 QUALITY ASSURANCE**

- .1 Qualifications: The *Contractor* shall *Provide* work of this Section, executed by competent installers with minimum five years' experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.
- .2 Materials and applied systems shall have full acceptance by the *Authority Having Jurisdiction*.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Store fireproofing materials in weathertight enclosure raised clear of the ground so they are protected from moisture.

- .2 Store materials in original undamaged sealed container with manufacturer's labels and seals intact to show the approval of Underwriters' Laboratories of Canada (ULC).
- .3 Discard any material which has come into contact with moisture prior to actual use.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Materials shall be listed in accordance with CAN/ULC S101-07 achieve required fire protection rating.
- .2 *Products* shall be asbestos free.
- .3 Water, bonding agents, binders, accessories, cleaning solvents, aggregates and sealers shall be in accordance with base material manufacturer's recommendation.
- .4 Metal lath or non-metallic fibre mesh: as recommended by applied fireproofing manufacturer for application to painted surfaces.

### **2.2 CEMENTITIOUS FIREPROOFING (WET-MIX)**

- .1 Description: Wet-mix spray-applied fire resistive materials (SFRM) consisting factory mixed dry formulation of gypsum or Portland cement binders and lightweight mineral or synthetic aggregates mixed with water to form slurry for conveyance and application.
- .2 Acrylic fireproofing adhesive and sealer: Vinyl acrylic copolymer emulsion of fine particle size, films retain high degree of flexibility and elongation.
- .3 Acceptable *Products*; standard density:
  - .1 AD Fire Protection Systems 'Southwest Fireproofing Type 5GP'.
  - .2 Grace Construction Products 'Monokote MK-6'.
  - .3 Isolatek International 'Cafco 300'.
  - .4 Or *Equivalent*.
- .4 Acceptable *Products*; medium density:
  - .1 A/D Fire Protection Systems Inc. 'Southwest Fireproofing Type 5MD'.
  - .2 Grace Construction Products 'Z-106 G'.
  - .3 Isolatek International 'Cafco 400'.
  - .4 Or *Equivalent*.

## **PART 3- EXECUTION**

### **3.1 PREPARATION**

- .1 Review locations of exposed/non-exposed fireproofed surfaces with the *Consultant* prior to application.
- .2 Prepare substrate in accordance with the printed instructions of the manufacturer of the sprayed fireproofing material to achieve required fire protection.
- .3 Mechanically fasten metal lath or non-metallic fibre mesh to painted surfaces to receive applied fireproofing in accordance with manufacturer's recommendations.

- .4 Apply medium coat of sealer to fireproofing in surfaces of indicated SFRM to prevent dust particles from becoming airborne.

### 3.2 APPLICATION

- .1 Apply sprayed-applied fireproofing in accordance with the printed instructions of the manufacturer of the sprayed fireproofing material, and as specified herein and in accordance with ULC or cUL design number.
- .2 Apply by the contour method in one or more coats of sufficient thickness to achieve the fire ratings as required in the Contract Documents.
- .3 Repair sprayed-applied fireproofing damaged by others after completion of the work of this Section. Costs for damage shall be borne by the responsible party. Coordinate work with other Sections.
- .4 *Install* the sprayed-applied fireproofing so that any movement of building structure acting alone or together does not tear, rupture, delaminate, puncture or perforate spray-applied fireproofing.

### 3.3 FIELD QUALITY CONTROL

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00 – Quality Control.

### 3.4 PROTECTION

- .1 Protect during installation any adjacent finished surfaces from contamination and damage due to the work under this Section.
- .2 Protect completed work, vulnerable corners, edges and surfaces liable to be damaged due to construction activities. *Provide* wood cover strips and sheet material as required to prevent damage.
- .3 Method and materials to effect protection are subject to review by the *Consultant*.

**END OF SECTION**

## PART 1 – GENERAL

### 1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including Sections of Division 01.

### 1.2 SECTION INCLUDES

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Administrative Requirements
- .5 1.5 Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Delivery Storage, and Handling
- .8 1.8 Field Conditions
- .9 2.1 Manufacturers
- .10 2.2 Performance/Design Requirements
- .11 2.3 Materials
- .12 3.1 Manufacturer's Instructions
- .13 3.2 Preparation
- .14 3.3 Installation
- .15 3.4 Identification
- .16 3.5 Field Quality Control

### 1.3 SUMMARY

- .1 Section includes:
  - .1 Materials installed in cavities, joints, around penetrations, and openings in floors, walls, partitions, and other building components to restrict the spread of fire and smoke.
- .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.

### 1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Read and be governed by conditions of the *Contract* and sections of Division 01.
- .2 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.

## 1.5 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data: Submit data and installation instructions for *Products* and prefabricated devices, 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;
  - .2 Listing agency's detailed drawing showing opening, penetrating items, and firestopping materials, identified with listing agency's name and number or designation, fire rating achieved, and date of listing.
  - .3 Manufacturer's specifications, detail sheets, and other data needed to prove compliance with the specified requirements;
  - .4 Certificates: Submit manufacturer's certification that installed firestopping and smoke seal *Products* are suitable for the use indicated and comply with specified requirements.
  - .5 Submit fire resistance rating test listings for firestopping and smoke seal systems.
  - .6 Manufacturer's engineering judgment identification number and *Shop Drawing* details when no Underwriters Laboratories of Canada (ULC) or other Canadian listed assembly or equivalent assembly acceptable to the *Consultant*, is available for an application. Engineered judgment must include both *Project* name and the *Subcontractor's* name who will install firestop system as described in *Shop Drawing*.
- .3 *Shop Drawings*:
  - .1 Submit *Shop Drawings* indicating fire resistance rated assembly number, required temperature, hose stream, and flame rating, material thicknesses, installation methods and materials of firestopping and smoke seals, primers, supports, damming materials as applicable, reinforcements, anchorages, fastenings and methods of installation for each condition to be encountered.
  - .2 Designate on *Shop Drawings* static through penetrations and dynamic joint systems, relative positions, expansion and control joints in rated slabs and walls, firestopping details at receptacles and similar poke-through devices and surrounding permanent materials. Identify re-entry locations.
- .4 Manufacturers' instructions:
  - .1 The *Contractor* shall ensure that the manufacturer of the *Products* proposed for use in the work of this Section prepares a firestopping manual scheduling the *Products* to be used for each assembly and installation required in the *Work*.
  - .2 The manual must include the manufacturer's *Product* data sheets
  - .3 Firestopping manual must be submitted within 20 working Days from the *Contract* award.

## 1.6 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 *Provide* work of this Section, executed by competent installers with minimum five years' experience in application of *Products*, systems and assemblies specified and with approval, training and certification of *Product* manufacturers.

- .1 Submit proof of the 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 a *Subcontractor* or installer engaged by the *Contractor* does not in itself confer qualification on the buyer.
- .2 The *Contractor* shall ensure that the installer *Subcontractor* designates a single individual as *Project* foreperson and shall also ensure this foreperson is present at the *Place of the Work* at all times when the work of this Section is being performed.
- .2 Regulatory requirements:
  - .1 Firestop systems shall be listed in accordance with CAN/ULC-S115-05 and tested assemblies shall achieve a fire resistance rating in accordance with the Ontario Building Code.
  - .2 Proposed firestopping and smoke seal materials and methods shall conform to City of Markham Fire requirements.

## 1.7 DELIVERY STORAGE, AND HANDLING

- .1 Deliver the materials to the *Place of the Work* in the manufacturer's unopened containers, containing the classification label, with labels intact and legible at time of use.
- .2 Store materials in accordance with the 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.

## 1.8 FIELD CONDITIONS

- .1 Comply with the 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 Acceptable manufacturers for work of this Section:
  - .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 Tremco Canada Ltd.
  - .7 Or *Equivalent*.

## 2.2 PERFORMANCE/DESIGN REQUIREMENTS

- .1 *Provide* firestop and smoke seal systems consisting of a material, or combination of materials installed to retain the integrity of fire-rated construction by effectively impeding the spread of flame, smoke, and/or hot gasses through penetrations, blank openings or gaps, membrane penetrations, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers.
- .2 *Provide* also smoke sealants applied over firestopping materials or combination smoke seal/firestop seal material to form air tight barriers to retard the passage of gas and smoke.
- .3 *Provide* fire-resistance rating equivalent to the rating of the adjacent floor, wall or other fire separation assembly.
- .4 *Provide* firestopping and smoke sealant system assemblies as practical and as required to coordinate with the schedule and sequencing of the *Work*.
- .5 Confirm locations of exposed/non-exposed firestopping/smoke seal surfaces with the *Consultant* prior to application.
- .6 *Provide* movement capability at movement joints in accordance with design requirements for movement joint.

## 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 The *Contractor* shall ensure that the manufacturer instructs the applicator *Subcontractor* in procedures for each material.
- .2 Firestopping and smoke seal systems shall conform to the following:
  - .1 Volatile Organic Compounds (VOC) content not to exceed 250 grams per 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- S115-05 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-S115-05.
  - .5 For services that penetrate a fire separation or a membrane forming part of an assembly required to have a fire-resistance rating, *Provide* firestop system with "F" rating as required by the Ontario Building Code.
  - .6 For combustible pipe penetrations through a fire separation required to have a fire-resistance rating, *Provide* firestop system with "F" rating as required by the Ontario Building Code.
  - .7 For services that penetrate a fire wall or a horizontal fire separation that is required to have a fire-resistance rating, *Provide* firestop system with "FT" rating as required by the Ontario Building Code.
  - .8 For joints in fire-separations, *Provide* firestop system as required by the Ontario Building Code.

- .9 *Products* shall be compatible with abutting dissimilar membranes, architectural coatings, finishes at floors, walls and ceilings. Check with requirements of the *Contract Documents* and manufacturer of selected materials being installed.
- .3 Smoke sealants for overhead and vertical joints shall be non-sagging; sealants for floors shall be self-levelling.
- .4 Smoke sealants at vertical through penetrations in areas with floor drains shall be waterproof type.
- .5 Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems).
- .6 Metal deck/wall penetration conditions with sprayed fireproofing: spray-on fire-rated firestop mastic.

## **PART 3 - EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: Comply with manufacturer's written *Product* data including *Product* technical bulletins, *Product* installation instructions and *Product* packaging instructions.

### **3.2 PREPARATION**

- .1 Examine sizes, anticipated movement and conditions to establish correct thickness and installation of back-up materials.
- .2 Clean bonding surfaces to remove deleterious substances including dust, paint, rust, oil, grease, moisture, frost and other foreign matter which may otherwise impair effective bonding.
- .3 Prime and mask adjacent surfaces. Mask areas adjacent to sprayed firestopping to limit firestopping overspray to area not greater than 25 mm (1") of minimum required.
- .4 Remove insulation from insulated pipe and duct where such pipes or ducts penetrate a fire separation unless listed assembly permits such insulation to remain within assembly, or where mechanical trades have installed special fire rated insulated sleeves.
- .5 Secure pipe, conduit, cable, and other items that penetrate firestopping and smoke seal systems.

### **3.3 INSTALLATION**

- .1 Mix and apply firestopping, gas and smoke seals in accordance with manufacturer's written instructions and tested designs to achieve required flame rated seal, to prevent the passage of gas and smoke and, where specifically designated, the passage of fluids.
- .2 *Provide* temporary forming and packing as required and other accessories in accordance with manufacturers' written instructions. Apply materials with sufficient pressure to properly fill and consolidate the mass to seal openings.
- .3 *Provide* fill materials for through-penetration firestop systems by techniques to achieve the following results:
  - .1 Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
  - .2 Install materials so that they contact and adhere to substrates formed by openings and penetrating items.



- .4 *Provide* joint fillers to *Provide* support of firestop materials during application and at the position required to produce the cross-sectional shapes and depths of installed firestop material relative to joint widths that allow optimum sealant movement capability and develop fire-resistance required.
- .5 For materials that will remain exposed after completing the *Work*, finish to *Provide* smooth, uniform surfaces. Tool or trowel exposed surfaces.
- .6 Seal joints to ensure an air and water resistant seal, capable of withstanding compressions and extensions due to thermal, wind or seismic joint movement.
- .7 Notify the *Consultant* when random completed installations are ready for review, as directed by the *Consultant*, prior to concealing or enclosing firestopping and as applicable, smoke seals.
- .8 Remove temporary forming and dams only after materials have gained sufficient strength.

### 3.4 IDENTIFICATION

- .1 Identify through-penetration firestopping and smoke seal systems with pressure- sensitive, self-adhesive, printed vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestopping system installation where labels will be visible to anyone seeking to remove penetrating items or firestopping and smoke seal systems. Include the following information on labels:
  - .1 The words: "Warning: Through-Penetration Firestopping system – Do Not Disturb";
  - .2 Applicator's name, address and phone number;
  - .3 Designation of applicable testing and inspection agency;
  - .4 Date of installation;
  - .5 Manufacturer's name for firestopping and smoke seal system materials.

### 3.5 FIELD QUALITY CONTROL

- .1 Quality control to be in accordance with Section 01 45 00 – Quality Control.
- .2 Field tests and inspections:
  - .1 The *Consultant* will review installation of the work of this Section and will perform random tests to verify its completion in accordance with the requirements of the *Contract Documents*.
  - .2 Give at least 48 hours' notice before operations commence, and arrange for a pre-job conference with the *Contractor*, the *Subcontractor*, the inspection and testing company, the manufacturer, and the *Consultant* present.
  - .3 Inspection and testing company shall examine penetration firestopping in accordance with ASTM E2174-09 and ASTM E2393-10a as applicable. Inspection and testing company shall examine firestopping and shall determine, in general, that firestopping has been installed in accordance with the requirements of the *Contract Documents* and the tested and listed firestop system.
  - .4 The *Contractor* shall ensure that the representatives of the manufacturer(s) have access to the *Work*. The *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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 1.6 Field Conditions
- .7 1.7 Extended Warranty
- .8 2.1 Sealants
- .9 2.2 Accessories
- .10 3.1 Manufacturer's Recommendations
- .11 3.2 Preparation
- .12 3.3 Masking
- .13 3.4 Installation
- .14 3.5 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Exterior building sealants.
    - .1 Exterior joint sealant is required at, but not limited to, the following locations::
      - .1 Around all exterior openings.
      - .2 Under and around all thresholds.
      - .3 At all joints between door and window frames and masonry.
      - .4 Around perimeter of all metal grilles and louvres.
      - .5 At control joints and expansion joints in unit masonry assemblies.
  - .2 Interior building sealants.
    - .1 Interior joint sealant is required at, but not limited to, the following locations:
      - .1 Around all door frames.
      - .2 In control joints in gypsum board walls and partitions.
      - .3 At junction of gypsum board ceilings and unit masonry assemblies.
      - .4 In control joints and expansion joints in unit masonry assemblies.

- .5 Between different materials abutting in the joint.
  - .6 Around windows.
  - .7 At the top of tiled bases and walls.
  - .8 At floor-wall joints and where indicated in the drawings.
- .3 The installations listed in this section shall not be considered to represent a complete list of all situations where joint sealers will be required for the *Work*. Thorough scrutiny of the complete *Contract Documents* shall be done in order to obtain a complete list of all situations where joint sealers are or may be required for the *Work*.

#### 1.4 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit the manufacturer's and *Product* name for each sealant which will be used in the *Work* prior to commencing the *Work*.
- .3 *Product* data sheets:
  - .1 Submit the manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.
- .4 Test sealant in contact with samples of materials to be sealed to verify adhesion will be achieved and no staining of the material will result. Prepare sample joints at the *Place of the Work* of each type of sealant for each joint condition.
  - .1 Submit test results to the *Consultant* prior to application of sealants.
- .5 Test sealant in contact with samples of porous materials to be sealed to ensure that no staining of the material will result in accordance with ASTM C1248-08 (2012).
  - .1 Submit test results to the *Consultant* prior to application of sealants.
- .6 Submit 2440 mm (96") long sealant joint mock-up.
- .7 Submit "wet sample" sealant colour samples for each sealant *Product* and colour.

#### 1.5 QUALITY ASSURANCE

- .1 Qualifications: *Provide* work of this Section, executed by competent installers with minimum five years' experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers. The *Contractor* shall ensure that the installer *Subcontractor* complies with quality assurance articles referenced in ASTM C1193-13 for installation of joint sealants.
- .2 Conduct quality control in accordance with Section 01 45 00 – Quality Control.

#### 1.6 FIELD CONDITIONS

- .1 Verify substrates and ambient air temperature at the *Place of the Work* before, during and after application to ensure compliance with the manufacturer's recommendations. Surfaces shall be frost-free, dust-free, clean and completely dry at time of installation.
- .2 Weather Conditions: In accordance with the 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 the manufacturer before sealant application.

- .3 Sealant and substrate materials: Conform to the sealant manufacturer's specifications and recommendations. Keep organic sealant materials heated to at least 16°C when working at temperatures below 10°C.

## 1.7 EXTENDED WARRANTY

- .1 Warranty work of this Section for a period of two years from the date of Substantial performance, in accordance with Section 01 78 36 - Warranties.
- .2 Repair or replace joint sealants which fail to perform as air tight and water-tight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, or general durability; or appear to deteriorate or become unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials and workmanship or in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated.
- .3 Defects shall include, but are not limited to:
  - .1 Staining from abutting materials or filler.
  - .2 Migrating, bleeding into, or staining abutting materials.
  - .3 Unightly surface deformation by causes other than movement.
  - .4 Excessive colour change, chalking, or dust pick-up.
  - .5 Failing adhesively or cohesively where maximum elongation is less than 25% of designed width of exposed joints.
  - .6 Hardening to more than 25% over specified hardness.

## PART 2 - PRODUCTS

### 2.1 SEALANTS

- .1 General:
  - .1 Colours: Sealant colours shall match colours of adjacent materials, as selected and approved by the *Consultant*:
    - .1 Colours shall be selected from the manufacture's full range of colours, generally to match adjacent finished 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 *Provide* joint sealants, primer(s) and backings that are compatible with one another and with joint substrates under conditions of service and application as demonstrated by joint sealant manufacturer based on proven test results and field experience.
  - .4 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*.

- .5 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 Interior sealants shall have Volatile Organic Compound (VOC) limit of less than 250 g/L.
- .3 Sealant designations:
  - .1 Type 1 – Urethanes Two Part.
    - .1 Non-sag, multi-component, epoxidized polyurethane sealant in accordance with CAN/CGSB 19.24-M90, Type 2, Class B.
    - .2 Location: use at all locations except where noted otherwise.
    - .3 Acceptable *Product*: Dymeric, as manufactured by Tremco Ltd. or *Equivalent*.
  - .2 Type 2 – Silicones One Part.
    - .1 One-part, acetoxysilicone sealant, mildew resistant, in accordance with CAN/CGSB 19.22- M89.
    - .2 Location: for washroom fixtures and vanity tops.
    - .3 Acceptable *Product*: Tremsil 200, as manufactured by Tremco Ltd. or *Equivalent*.
  - .3 Type 3 – Acrylics One Part.
    - .1 Acrylic terpolymer sealant, solvent release, in accordance with CGSB 19-GP-5M-1984.
    - .2 Location: at interior joints between windows, door frames, and screen frames.
    - .3 Acceptable *Product*: Mono 555, as manufactured by Tremco Ltd. or *Equivalent*.
  - .4 Type 4 – Acoustical Sealant.
    - .1 Siliconized acrylic latex sealant, in accordance with CGSB 19.21-M87.
    - .2 Location: at all perimeter joints and openings in gypsum board systems.
    - .3 Acceptable *Product*: Tremflex 834, as manufactured by Tremco Ltd. or *Equivalent*.
  - .5 Type 5 – Urethanes Two Part.
    - .1 Non-sag, multi-component, chemically cured, polyurethane sealant in accordance with CAN/CGSB 19.24-M90, Type 2, Class B.
    - .2 Location: at control joints in masonry assemblies.
    - .3 Acceptable *Product*: Dymeric511, as manufactured by Tremco Ltd. or *Equivalent*.
  - .6 Type 6 – Urethanes Two Part.
    - .1 Non-sag, multi-component, chemically cured, polyurethane sealant in accordance with CAN/CGSB 19.24.
    - .2 Location: at all locations calling for Ethylene Propylene Diene Terpolymer (EPDM) membrane.
    - .3 Acceptable *Product*: Lexcan pourable sealer or *Equivalent*.

- .7 Type 7 – Urethanes One Part.
  - .1 Non-sag, single component, polyurethane sealant in accordance with CAN/CGSB 19.13-M87.
  - .2 Location: at metal flashing and trim.
  - .3 Acceptable *Product*: RC-1 Sealant as manufactured by Lexsuco or *Equivalent*.
- .8 Type 8 – Polyurethane One Part
  - .1 Non-sag, single component, moisture curing, modified polyurethane sealant in accordance with CGSB 19.12, class MC-2-25-B-N.
  - .2 Location: as toe bead filling void beneath glazing strip in Window Wall in accordance with Section 08 41 00 - Aluminum Framed Glazing Systems.
  - .3 Acceptable *Product*: DyMonic, as manufactured by Tremco Ltd. or *Equivalent*.
- .9 Type 9 – Structural Silicone.
  - .1 Non-sag, single component, elastomeric, chemical curing, neutral core, medium modulus silicone sealant in accordance with CAN/CGSB 19.13-M87, MCG-2-25-A-L.
  - .2 Location: as structural silicone sealant in window wall in accordance with Section 08 41 00 - Aluminum Framed Glazing Systems.
  - .3 Acceptable *Product*: Spectrum 2, as manufactured by Tremco Ltd. or *Equivalent*.
- .10 Type 10 – Acrylics One Part.
  - .1 Single component, elastomeric, water based, acrylic firestop sealant in accordance with CAN/ULC-S115-11.
  - .2 Location: fire rated joints and penetrations in fire rated systems.
  - .3 Acceptable *Product*: TREMstop Acrylic, as manufactured by Tremco Ltd. or *Equivalent*.
- .11 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 GE Silicones "Sanitary SCS1700 Sealant";
    - .2 BASF Building Systems "OmniPlus";
    - .3 Dow Corning "786";
    - .4 Tremco, Inc. "Tremsil 200";
    - .5 Or *Equivalent*.

## 2.2 ACCESSORIES

- .1 General: *Provide* component joint sealant primers, backings and fillers that are compatible with joint substrates and other sealants or joint fillers specified and approved for applications indicated under joint sealant schedule.
- .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 for vertical joints; round shape for open joints and triangular shape for angular joints.
  - .2 Use closed cell foam for horizontal joints.
- .3 Expansion Joint Cap: *Provide* premanufactured expansion joint cap Snap-Cap as manufactured by W.R.Meadows (or equivalent).
- .4 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.
- .5 Masking Tape: Non-staining, non-absorbent and compatible with joint sealants and adjacent surfaces.
- .6 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.
- .7 Cleaners for nonporous surfaces: *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.
  - .1 *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 Prior to installation, clean substrates of substances that could impair the bond of joint sealants. Clean and prepare joint surfaces immediately before installing joint sealants. Protect adjacent work areas and finished surfaces from damage during joint sealant installation.
- .2 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. *Provide* a dry, dust-free and cleaned substrate for optimum results.

- .3 Non-porous surfaces should be cleaned using the two-cloth solvent wipe method as referenced in ASTM C1193-13 and outlined by joint sealant manufacturer's instruction. IPA (isopropyl alcohol) is not a degreasing solvent yet may be used in new construction for non-porous joint cleaning and preparation. Use xylene, toluene or Methyl Ethyl Ketone (MEK) for degreasing solvent and general cleaning of non-porous surfaces.
- .4 Rusting or scaling surfaces must 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.
- .5 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.
- .6 Test materials for indications of staining or poor adhesion before any sealing is commenced. Submit results reports in writing to the *Consultant*.

### 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 Comply with joint sealant manufacturer's installation instructions for *Products*, primers and applications indicated unless more stringent *Project*-specific instructions or requirements apply.
- .3 Apply joint sealants for continuous waterproof sealant joint protection. Vertical joints should be lapped over horizontal joints as recommended by the sealant manufacturer. Comply with installation recommendations in ASTM C1193-13 for use of joint sealants as applicable to each specific sealant installation.
- .4 *Install* sealant primers only when recommended by the 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.
- .5 *Install* joint sealants in accordance with the joint sealant manufacturer's instructions 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.
- .6 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 the 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- 13 unless otherwise indicated in the Contract Documents. Dry tooling is required for joint sealants, and wet tooling agents are not allowed.
- .2 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.
- .7 Allow single-component sealants to fully cure before adhesion testing is performed as recommended by the joint sealant manufacturer.
- .8 Match approved sealant mock-up for colour, finish and overall aesthetics. Remove, refinish or re-install, at the *Contractor's* expense, work not in compliance with the *Contract Documents*.
- .9 When surfaces of adjacent materials are to be painted, perform sealant work before these surfaces are painted.
- .10 Check to make sure shop paint is compatible with primer and sealant. When incompatible, inform the *Consultant* and change primer and sealant to compatible type acceptable to the *Consultant*.
- .11 Check form release agent used on concrete for compatibility with primer and sealant. If they are incompatible, inform the *Consultant* and change primer and sealant to compatible type, or clean concrete to sealant manufacturer's acceptance.
- .12 *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 the sealant manufacturer.
- .13 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 in this Section.
- .14 On horizontal traffic surfaces, support joint filler against vertical movement which might result from traffic loads, including foot traffic.
- .15 Pack joints tightly with sealant backing set at depth specified for sealant. Fill other voids with filler.
- .16 *Install* bond breaker tape in bottom of joints in lieu of sealant backing where proper depth cannot be obtained when backing is installed.
- .17 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 the manufacturer's written recommendations.
- .18 Fillet bead sealant joints to be sized to *Provide* proper contact area with substrates, in accordance with the manufacturer's written recommendations.
- .19 Apply sealants using pressure-operated guns fitted with suitable nozzles in accordance with the manufacturer's directions. Apply sealants in such manner as to ensure good adhesion to sides of joints and to completely fill voids in joints.
- .20 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.

- .21 Remove droppings and excess sealant as work progresses, before material achieves initial set. Do not use soap and water in tooling.
- .22 *Install* sealant materials and primers when surfaces are prepared, and ambient temperature and weather conditions are prevalent, consistent with the manufacturer's recommendations. Primer is mandatory for gun applied sealants.
- .23 *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.
- .24 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 ADJUSTING AND CLEANING**

- .1 Clean off excess sealant or sealant residue adjacent to sealant joint installations as the work progresses by methods approved by the joint sealant manufacturer. Do not damage adjacent surfaces with harmful removal techniques and protect finished surfaces beyond those that have been masked. Protect installed sealants during and after final curing from damage resulting during construction. Remove and replace damaged joint sealants, at the *Contractor's* expense.
- .2 Remove temporary coverings and masking protection from adjacent work areas upon completion. Remove construction debris from the *Site* on a planned and regular basis.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Administrative Requirements
- .5 1.5 Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Delivery, Storage, and Handling
- .8 2.1 Performance/Design Requirements
- .9 2.2 Materials
- .10 2.3 Fabrication - General
- .11 2.4 Fabrication – Steel Doors and Panels
- .12 2.5 Fabrication – Steel Frames
- .13 2.6 Hardware Reinforcements and Preparations
- .14 2.7 Frame Anchorage
- .15 2.8 Sizes and Tolerances
- .16 2.9 Hardware Locations
- .17 3.1 Examination
- .18 3.2 Installation – Steel Doors and Frames
- .19 3.3 Installation - Finishing Hardware
- .20 3.4 Adjusting and Cleaning

### **1.3 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).

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination:
  - .1 Cooperate fully with finish hardware distributor's representative during preparation of *Shop Drawings* and execution of shop fabrication.

## 1.5 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit copy of National Association of Architectural Metal Manufacturers – Hollow Metal Manufacturers Association (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 the *Drawings* and in the door schedule.
  - .3 Electrified hardware requirements and preparations shall be clearly indicated on *Shop Drawings*.

## 1.6 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) or *Equivalent* association acceptable to the *Consultant*.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Inspect materials thoroughly upon receipt and report immediately discrepancies, deficiencies and damages, in writing, to the *Supplier*.
- .2 Note damages incurred during shipment on carriers' bill of lading and report immediately, in writing, to the *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 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 in accordance with 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 National Fire Protection Association (NFPA) 80, except where indicated otherwise in the *Contract Documents*.

## 2.2 MATERIALS

- .1 Steel:
  - .1 Fabricated from tensioned levelled steel in accordance with ASTM A924/A924M-14, galvanized in accordance with 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 *Equivalent* minimum base steel thicknesses for gauges shall be in accordance with Appendix 1 of Canadian Steel Door Manufacturers Association (CSDMA) "Recommended *Specifications* for Commercial Steel Door and Frame Products".
  - .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 Polystyrene: Expanded Polystyrene (EPS), Type 1, density: 16 to 32 kg/m<sup>3</sup> (1 to 2 pcf), thermal values: RSI 1.06 (R 6.0) minimum, conforming to ASTM C578-14a.
  - .3 Polyisocyanurate: Closed cell, faced board, thermal value: Relative Strength Index (RSI) 2.17 (R12.3) minimum, conforming to ASTM C1289-14a.
- .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 – Door Hardware.
- .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 1 mm (0.039") (20 gauge) steel, 15.9 mm (5/8") high.

## 2.3 FABRICATION - GENERAL

- .1 Fabricate steel doors, frames, transoms, sidelights and borrowed lights as applicable, to the design and dimensions indicated in the *Contract Drawings*. 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 in the Contract Documents.
- .3 Operating clearances:
  - .1 *Provide* clearance at floor with allowance made for indicated finish flooring materials.
  - .2 Clearances for Fire-Rated Doors: As required by National Fire Protection Association (NFPA) 80.
  - .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, or manufacturers recommendations.
- .5 Countersink exposed fasteners unless otherwise shown in the Contract Documents. Use flat or oval head screws.
- .6 Reinforce components to resist stresses imposed by hardware in use.
- .7 Allow for anticipated expansion and contraction of frames and supports.
- .8 Fit elements at intersections and joints accurately together, in true planes, and plumb and level.
- .9 Weld continuously at joints exposed to view or at joints through which air or water could penetrate from the exterior of building to the interior.
- .10 Perform welding in accordance with CSA W59-15.
- .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 and temperature rise ratings.

## 2.4 FABRICATION – STEEL DOORS AND PANELS

- .1 Fabricate steel doors and panels to a thickness of 45 mm (1-3/4"), unless indicated otherwise in the Contract Documents.
- .2 Exterior and insulated doors and panels:
  - .1 Face sheets fabricated from 1.60 mm (0.063") 16 gauge steel.
  - .2 Insulation core:
    - .1 Polystyrene.
    - .2 Polyisocyanurate.

- .3 Longitudinal edges mechanically interlocked.
  - .1 Adhesive assisted with edge seams visible.
- .3 Interior doors and panels:
  - .1 Face sheets fabricated from 1.087 mm (18 gauge) steel.
  - .2 Honeycomb core.
  - .3 Longitudinal edges mechanically interlocked.
    - .1 Adhesive assisted with edge seams visible.
- .4 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.
- .5 Formed edges shall be true and straight with minimum radius for the thickness of steel used.
- .6 Lock and hinge edges shall be bevelled 3 mm in 50 mm (1/8" in 2") unless hardware or door swing dictates otherwise.
- .7 Top and bottom of doors shall be provided with inverted, recessed, 1.60 mm (0.063") 16 gauge steel end channels, welded to each face sheet at 50 mm (2") on centre maximum.
- .8 Prior to shipment, mark each door with an identification number as shown on the approved shop drawings.
- .9 Exterior doors shall be provided with factory installed flush Polyvinyl chloride (PVC) top caps. Fire labelled exterior doors shall be provided with factory installed flush steel top caps.
- .10 Blank, reinforce, drill and tap doors for mortised, templated hardware. Locate hardware to manufacturer's standard unless indicated otherwise in the Contract Documents.
- .11 Holes 12.7 mm (1/2") and larger shall be factory prepared.
- .12 Glazing:
  - .1 For glazing materials up to and including 8 mm (5/16") thick, doors shall be provided with 1.00 mm (0.039") 20 gauge steel glazing trim and snap-in glazing stops.
  - .2 For glazing materials greater than 8 mm (5/16") thick, doors shall receive 1.00 mm (0.039") 20 gauge steel trim and screw fixed glazing stops. Screws shall be #6 x 32 mm (1¼") oval head TekTM (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.
- .13 Fabricate closing stiles of paired doors as indicated in the Shop Drawings and Contract Documents. .
- .14 Where indicated in the *Contract Documents*, 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.

## 2.5 FABRICATION – STEEL FRAMES

- .1 General: Applicable to frames, transom panel frames, sidelights, and window assemblies.
- .2 Interior and non-thermally broken frames; welded:

- .1 Fabricated from:
  - .1 1.60 mm (0.063") 16 gauge steel.
  - .2 1.98 mm (0.078") 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 (SUW) corner joints
  - .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 SUW 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 1.00 mm (0.039") 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 1.60 mm (0.063") 16 gauge steel splice plates securely welded into one section, extending 100 mm (4") minimum each side of splice joint.
  - .2 Field splices at closed sections (mullions or center rails) shall be 1.60 mm (0.063") 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* two 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: three at strike jamb.
  - .2 Pair of interior doors: two at header.
  - .3 Dutch doors: four at strike jamb.



- .4 Weather-stripped doors: None required.
- .5 Sound, light, or smoke sealed doors: None required.
- .6 Transom panels: two 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 in the Contract Documents.
- .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 1.60 mm (0.063") 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.
- .19 Where removable mullions provided under this Section are indicated, head or transom mullion shall be reinforced. *Provide* loose mounting bracket/shoe mechanical fasteners and installation instructions.

## 2.6 HARDWARE REINFORCEMENTS AND PREPARATIONS

- .1 Door and frame *Product* shall be blanked, reinforced, drilled and tapped at the factory for fully templated mortise hardware only, in accordance with the approved hardware schedule and templates provided by the hardware *Supplier*.
- .2 Door and frame *Products* shall be factory blanked and reinforced only for mortised hardware that is not fully templated.
- .3 Where surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware are required frame *Product* shall be reinforced only, with drilling and tapping done by field installation.
- .4 Templated holes 12.7 mm (1/2") diameter and larger shall be factory prepared, except mounting and through bolt holes, which shall be by installation on the *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 3.51 mm (0.138") 10 gauge steel minimum, high frequency type shall be provided by the Contractor.
- .6 Frames shall be prepared for 114 mm (4.5") standard weight hinges minimum unless otherwise indicated in the Contract Documents.

- .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 1.60 mm (0.063") 16 gauge steel minimum, with extruded tapped holes that *Provide* equivalent number of threads as 2.74 mm (0.108") 12 gauge.
- .9 Reinforcements for surface mounted hardware, concealed closers and holders and flush bolts shall be 1.30 mm (0.051") 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 0.84 mm (0.033") 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 in the Contract Documents, shall be provided by the Contractor 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 (i.e. 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 – Door Hardware. At time of frame manufacture, electrical connection boxes shall be supplied by Divisions 26 and 28 for installation into frame by work of this Section.
    - .2 Frame electrical connection boxes shall be positioned flush to edge of frame face return. Clearance shall be maintained to allow wall material to be consistently applied for length of frame member. Frame connection boxes shall be welded in place and positioned to allow necessary clearance for electrical *Subcontractor* 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 – Door Hardware and obtain hardware templates for electrified hardware clearly indicated on reviewed *Shop Drawings* and prior to door manufacture.

## 2.7 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, 1.60 mm (0.063") 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 1.00 mm (0.039") 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 1.60 mm (0.063") 16 gauge anchor bolt guides.
- .6 The *Contractor* shall ensure that anchor bolts and expansion shell anchors for the above preparations are provided by the installation company.
- .7 Where frame product is installed prior to construction of the adjacent wall, each jamb shall be provided with 1.60 mm (0.063") 16 gauge steel floor anchors. Each anchor shall be provided with 2 holes for mounting to the floor and shall be securely welded to the inside of the jamb profile.
- .8 On sidelights or windows exceeding 3 m (9'-10") in width, installed in stud partitions, channel extensions shall be provided from the top of the frame assembly to the underside of the structure above. Extensions shall be fabricated from 2.74 mm (0.108") 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. The *Contractor* shall ensure that Channels are mechanically connected to mounting angles and adjusting brackets with supplied fasteners, on *Site*, by the *Subcontractor* responsible for installation.

## 2.8 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 ( $\pm 0.015$ ").

## 2.9 HARDWARE LOCATIONS

- .1 Hardware preparations in frame *Product* shall be as noted below and locations on doors shall be adjusted for clearances specified in subsection 2.8 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 subsection 2.8 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.
- .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 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.
- .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 National Association of Architectural Metal Manufacturers – Hollow Metal Manufacturers Association (NAAMM-HMMA) 840-07, maintaining clearances outlined in paragraph 2.8 of this section.
- .9 *Install* finishing hardware in accordance with ANSI A115.1G-1994, manufacturers' templates and instructions, and Section 08 71 00 – Door Hardware.
- .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 two anchors for openings up to and including 1525 mm (60") high and install one 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.
- .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 - Painting.
- .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 - Painting.
- .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 – Door Hardware.
- .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 - Door Hardware.

### **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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 General Instructions
- 1.2 Section Includes
- 1.3 Summary
- 1.4 Submittals
- 1.5 Closeout Submittals
- 1.6 Quality Assurance
- 1.7 Delivery, Storage, and Handling
- 2.1 Performance/Design Requirements
- 2.2 Materials
- 2.3 Four-Fold Metal Doors
- 2.4 Motorized Operation
- 2.5 Fabrication
- 3.1 Examination
- 3.2 Electrical Wiring
- 3.3 Installation – General
- 3.4 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Four-fold metal doors; motorized.
- .2 All costs associated with the work of this Section shall be included in the *Contract Price*.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
  - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.
- .3 *Shop Drawings*:
  - .1 Include details of each door and frame type, hardware types and locations, frame profiles, door and frame elevations, anchor details and locations.
  - .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on the *Drawings* and in the door schedule.
  - .3 Indicate materials, operating mechanisms, required clearances and electrical connections

## 1.5 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .2 Operation and maintenance data:
  - .1 Submit manufacturer's maintenance instructions for incorporation into the operation and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Manufacturers: The *Contractor* shall ensure that doors are manufactured by a firm with a minimum of 10 years' experience in the fabrication and installation of specified doors.
    - .1 The *Contractor* shall ensure that manufacturers proposed for use, which are not named in these *Specifications*, submit evidence of ability to meet performance and fabrication requirements specified in Division 8 of the specifications, and include a list of five projects of similar design and complexity completed within the past five years.
  - .2 Installers / applicators / erectors: The *Contractor* shall ensure that the installation of doors is performed by the authorized representative of the manufacturer.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Package or crate, and brace *Products* to prevent distortion in shipment and handling. Label packages and crates and protect finish surfaces by sturdy wrappings.

## PART 2- PRODUCTS

### 2.1 PERFORMANCE/DESIGN REQUIREMENTS

- .1 Exterior door construction shall be designed to withstand wind load in accordance with the requirements of the Ontario Building Code.

### 2.2 MATERIALS

- .1 General:
  - .1 Single-source responsibility: *Provide* doors, tracks, motors, and accessories from one manufacturer for each type of door. *Provide* secondary components from source acceptable to manufacturer of primary components.
- .2 Steel:
  - .1 Structural steel: ASTM A36/A36M.
    - .1 Hot dip galvanizing: for irregular sections, conforming to CAN/CSA G164- M92, minimum zinc coating of 600 g/m<sup>2</sup> (21 oz. /ft<sup>2</sup>).
  - .2 Steel sheets: Steel sheets of commercial quality, complying with ASTM A36/A36M cold-rolled steel sheet, or ASTM A1011/A1011M-10 hot-rolled steel sheet.
    - .1 Zinc coated sheet steel: sheet steel to ASTM A653/A653M-11 with coating designation Z275 (G90) to ASTM A924/A924M-14.
- .3 Hardware: Door manufacturer's standard heavy-duty hardware components, galvanized.



.4 Fasteners:

- .1 Zinc-coated steel.

## 2.3 FOUR-FOLD METAL DOORS

.1 Manufacturers/Acceptable *Products*:

- .1 Door Engineering and Manufacturing Company, Tel: 1-800-959-1352, or *Equivalent*.

.2 Acceptable *Product*:

- .1 Door; complete with glazing panels: 'FF300 Series' as supplied by Northern Dock Systems Inc. or *Equivalent*.

.2 Construction:

- .1 Door assembly shall be fully welded minimum 2.5 mm (0.1") 11-gauge structural steel tube framing with sheet steel facing on the exterior and interior faces, hot-dipped galvanized after door fabrication.

- .2 Steel sheeting shall be formed on vertical edges with no visible welds on interior or exterior panel faces.

- .1 Face sheets fabricated from:

- .1 1.5 mm (0.06") 16-gauge steel.

- .3 Frames and framing members shall be true to dimension and square in all directions, and no door shall be bowed, warped, or out of line, in the vertical or horizontal plane of the door opening by more than 3 mm in 6000 mm (1/8" in 20').

- .4 Exposed welds and welds which interfere with the installation of various parts shall be ground smooth and flush.

- .5 Door panels thickness: 50 mm (2") thick minimum.

.6 Insulation:

- .1 Fibreglass

.7 Door finish:

- .1 All steel shall be painted with standard factory applied gray oxide primer. Finish paint shall be factory applied: Ral Color 7024 (Charcoal Gray) or *Equivalent*.

.3 Operating hardware:

- .1 Hardware shall include guide tracks and brackets, trolleys, guides, not less than three pairs of jamb and fold hinges per opening, and all bolts, nuts, fasteners, etc. necessary for complete installation and operation.

- .2 Jamb hinges shall be dual shear and have two thrust bearings and two needle bearing.

- .3 Fold hinges shall be dual shear with two thrust bearings.

- .4 Bearings shall be completely concealed within hinge barrels.

- .5 Hinge pins shall be non-removable, minimum 19 mm (3/4") diameter hardened steel.

- .6 Trolleys to be equipped with nylon, bronze or ball bearing rollers.

.4 Weatherstripping:

- .1 Material shall be adjustable and readily replaceable and *Provide* a substantially weathertight installation.
- .2 Weatherstripping at and bottom shall be 1.6 mm (1/16") cloth inserted neoprene.
- .3 Weatherstripping shall be retained continuously.
- .4 Perimeter weatherstripping: Jamb and head weatherstripping, 1.6 mm (1/16") cloth-inserted neoprene bulb or closed cell neoprene.

.5 Glazing panels:

- .1 Vision panels: *Provide* vision panels of type, size, shape and location as noted on the *Drawings*.
  - .1 Glazing type: 25mm, Sealed, insulated, tempered, grey tinted units, with Low E coating on 2<sup>nd</sup> surface – Pilkington Energy Advantage or *Equivalent*.
  - .2 *Provide* Bird-Friendly dots in accordance with the *Contract Documents*.

## 2.4 MOTORIZED OPERATION

.1 Motorized operation:

- .1 Door opening speed: 0.6096 mm/s (2 fps).
- .2 Each four-fold door shall be operated by an overhead mounted electro- mechanical drive unit designed for high cycle operation. Operator consists of an electric motor, gear reducer, and rotating drive arm. The door shall be operated with connecting rods attached to rotating drive arm on the operator and to control arms attached to the jamb door section and to the door lintel. The connecting rods shall be positive drive, keeping the door under firm control at all times. The connecting rods shall be fitted with spherical bearings and control arms shall be equipped with oil impregnated bronze bearings on polished shafts.
- .3 Operator shall be instantly reversible, open and close rapidly and start and stop gradually. Operator shall be adjustable to allow door to fully clear the opening. Operator shall automatically lock the door in the closed position. Operator shall be equipped with disengaging mechanism to convert to free wheeling mode for manual operation.
- .4 Electric motor shall be of sufficient size to operate doors under normal operating conditions at no more than 75 percent of rated capacity.
- .5 Power supply: 3 phase 230 VAC, 60 Hertz, unless otherwise indicated.
- .6 Electric controls: Controls shall be furnished by the door manufacturer and shall be complete for each door, and built in accordance with the latest National Electrical Manufacturers Association (NEMA) standards. Control circuits shall not exceed a nominal 110 volts.
  - .1 Controls shall include a self diagnostic programmable logic controller with digital message display and input LED. Controller shall include programmable close time delays and maximum open and close run-time timers.
  - .2 Motor starters shall be magnetic reversing, factory wired with overload and under voltage protection, and equipped with mechanical interlocks. All control components shall be enclosed in one enclosure with a wiring diagram placed on the inside of the cover.

- .3 Enclosures shall be NEMA 4 with programmable door logic controller, Variable Frequency Drive (VFD) for Speed Control, O/C/S Pushbuttons, Auto/Hand selector switch and power disconnect.
- .4 Pushbuttons for each door shall have one momentary pressure three-button push-button station marked "OPEN", "CLOSE" and "STOP". Push button enclosure shall be NEMA 4.
- .5 Limit switches shall be provided to stop the travel of the door in its fully open or fully closed position.
- .7 Safety edges: Electric safety edges on leading edge of all doors to reverse door upon contact with obstruction.
- .8 Photo eyes: One interior and one exterior mounted photo eye (sender/receiver type) with mounting brackets. Photo eyes shall be NEMA 4.
- .9 Remote control units:
  - .1 *Provide* radio receiver and single button remote control units.
  - .1 Quantity; remote control units: as directed by the *Consultant*.
- .10 Wiring: Door manufacturer shall supply controls only. The *Contractor* shall ensure that the electrical *Subcontractor Installs* controls, and furnishes and Installs conduits and wiring for *Site* power and control wiring.

## 2.5 FABRICATION

- .1 Fabricate work of this Section with materials, and with component dimensions and gauges, reinforcing, attached anchors and fastenings of adequate strength to prevent warping, buckling, opening of joints and seams, loosening of hardware, distortion, and displacement within limits of intended and specified use.
- .2 Conceal and weld connections wherever possible.
- .3 Fit joints and junctions between components tightly and in true planes.
- .4 Isolate from each other dissimilar metals, and metal from concrete or masonry to prevent electrolysis. On aluminum, use bituminous paint in concealed locations and lacquer where exposed to view.
- .5 Finishing:
  - .1 File and grind exposed welds smooth.
  - .2 Zinc coating: clean and smooth ground surfaces at welds, fill if necessary, and prime all areas from which zinc coating has been removed with zinc rich paint applied in a minimum thickness of 0.102 mm (0.004").

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- .1 Examine building structure, finishes and conditions at the *Place of the Work*.
- .2 Notify the *Consultant* of any adverse conditions which could jeopardize system installation or system operation. Do not proceed until such conditions have been documented, assessed, rectified and approved for installation. Starting work indicates acceptance of conditions unless the *Consultant* is notified otherwise in writing.

### 3.2 ELECTRICAL WIRING

- .1 Power shall be brought up to circuit breaker/disconnect switch adjacent to controller and in conformance with requirements specified in this Section.
- .2 Wiring from motor to switches, controls, starters, safety devices and other items requiring power shall be carried out under work of this Section.
- .3 Use Electric Metallic Tube (EMT) conduit for fixed wiring. Use purpose-made and approved type flexible cables or cords at applicable locations; adequately support so as not to impede access or foul moving parts of equipment.

### 3.3 INSTALLATION – GENERAL

- .1 *Install* doors and operators in accordance with the door manufacturer's printed instructions.
- .2 The *Contractor* shall ensure that *Work* is performed by qualified personnel approved by door manufacturer.
- .3 Fit doors snugly to edges of jambs and heads of frames. Doors shall operate smoothly and freely under all conditions of operation. Door shall sit in any position in door opening and shall not drift upward or downward.
- .4 Furnish necessary appurtenances relating to door installation, including those required on door frames.
- .5 Upon completion of installation of doors and operating equipment, lubricate moving parts prior to putting into operation. Supply oil to gear reduction units and grease sprockets, bearings, cables, link chains and door guides. Check and re-adjust as required, items of operating hardware, including weatherstripping.
- .6 *Install* doors to operate freely and to close tight.
- .7 Full commissioning and training shall be completed after installation.

### 3.4 ADJUSTING AND CLEANING

- .1 Adjust work of this Section to ensure free-running, tightly closing and properly counterbalanced operation. Ensure that installation is free from warp, twist or other distortion. Lubricate operating hardware.
- .2 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at the *Site* only if approved.
- .3 Clean work on completion of installation.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Refer to Provisional Items Table included in the *Contract Documents*.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Closeout Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Delivery, Storage, and Handling
- .8 2.1 Manufacturer
- .9 2.2 Performance/Design Requirements
- .10 2.3 Materials
- .11 2.4 Accessories
- .12 2.5 Hardware
- .13 2.6 Finishes
- .14 2.7 Motorized Operation
- .15 2.8 Fabrication
- .16 3.1 Examination
- .17 3.2 Electrical Wiring
- .18 3.3 Installation – General
- .19 3.4 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Sectional overhead metal doors.
  - .2 All costs associated with the work of this Section shall be included in the *Contract Price*.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
  - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.
- .3 *Shop Drawings*:

- .1 Include details of each door and frame type, hardware types and locations, frame profiles, door and frame elevations, anchor details and locations.
- .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on the *Drawings* and in the door schedule.
- .3 Indicate materials, operating mechanisms, required clearances and electrical connections

## 1.5 CLOSEOUT SUBMITTALS

- .1 Operation and maintenance data:
  - .1 Submit manufacturer's maintenance instructions for incorporation into the operation and maintenance manuals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.

## 1.6 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Manufacturers: The *Contractor* shall ensure that sectional doors are manufactured by a firm with a minimum of five years' experience in the fabrication and installation of sectional doors. The *Contractor* shall ensure that manufacturers proposed for use, which are not named in these *Specifications*, submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years.
  - .2 Installers / applicators / erectors: The *Contractor* shall ensure that the installation of sectional doors is performed by the authorized representative of the manufacturer.

## 1.7 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 MANUFACTURER

- .1 Acceptable *Product*:
  - .1 Aluminum A175A-NDS as supplied by Northern Dock Systems Inc. or *Equivalent*.

### 2.2 PERFORMANCE/DESIGN REQUIREMENTS

- .1 Design exterior door assembly to withstand windload of 1 kPa (0.1 PSI) with a maximum horizontal deflection of 1/240 of opening width.
- .2 Design door panel assemblies with thermal insulation factor R14.
- .3 Design door panel assemblies to withstand minimum 100,000 cycles per annum.

### 2.3 MATERIALS

- .1 General:
  - .1 Single-Source Responsibility: *Provide* doors, tracks, motors, and accessories from one manufacturer for each type of door. *Provide* secondary components from source acceptable to manufacturer of primary components.

- .2 Galvanized steel sheet: 0.5 mm (0.02") roll formed commercial quality in accordance with ASTM A653/A653M-08 with Z275 zinc coating to both faces.
- .3 Steel structural shapes, plates, bars, angles, dowels, and the like: in accordance with CSA G40.21-04, grade 300W.
- .4 Aluminum extrusions: 6063-T6 alloy and temper, clear anodized.
- .5 Touch-up primer: in accordance with CAN/CGSB 1.181-M99 for galvanized steel surfaces.
- .6 Insulation: polyurethane, to achieve R14.
- .7 Glazing: clear, sealed, insulated, tempered, grey tinted units fitted into Polyvinyl Chloride (PVC) snap-on mouldings for easy replacement.
- .8 Cable: multi-strand galvanized steel aircraft cable in accordance with ASTM A1023M.
- .9 Solid kick proof bottom section (plywood core).

## 2.4 ACCESSORIES

- .1 Overhead horizontal track and operator supports: galvanized steel, type and size to suit installation.
- .2 Track guards: 5 mm (1/4") thick formed sheet 1500 mm (59") high.
- .3 Pusher springs.
- .4 Weather stripping: aluminum vinyl C 'Arctic' standard.

## 2.5 HARDWARE

- .1 All hardware to be galvanized steel.
- .2 Track: standard hardware with 75 mm (3") size minimum 2.28 mm (0.09") core thickness galvanized steel track.
- .3 Track supports: 2.3 mm (0.1") core thickness continuous galvanized steel angle track supports constructed of 32 mm (1-1/4") x 4.76 mm (0.2") steel angle neatly cut and connected. Punched steel angle is not acceptable.
- .4 Spring counter balance: heavy duty oil tempered torsion spring with manufacturer's standard brackets and as follows:
  - .1 Minimum rating: 100,000 cycles per annum.
  - .2 Drum: 133 mm (5.2") diameter.
  - .3 Shaft: 25 mm (1") diameter solid steel.
  - .4 *Install* cycle counter device.
- .5 Top roller carrier: galvanized steel minimum 2.28 mm (0.09") thick adjustable.
- .6 Rollers: full floating, grease packed hardened steel, ball bearing minimum 75 mm (3") diameter, stamped tire.
- .7 Roller brackets: adjustable, galvanized steel, 2.5 mm (0.1") thick.
- .8 Hinges: standard duty industrial 2.28 mm (0.09") thick galvanized steel.

- .9 Cable: minimum 4 mm (0.2") diameter galvanized aircraft cable.

## 2.6 FINISHES

- .1 Exposed aluminum surfaces; anodized to American Architectural Manufacturers Association (AAMA) 611:

- .1 Clear anodized in accordance with AA Designation AA-M12C22A41

## 2.7 MOTORIZED OPERATION

- .1 Motorized Operation: Jackshaft type:

- .1 Heavy duty: SDI Model S19.85 or equivalent, voltage to suit supply voltage.

- .2 Auxiliary operation: include hand chain to operate door manually and independently of motor operator. Incorporate interlock to disconnect motor mechanically and electrically when auxiliary operator is engaged.

- .3 *Provide* momentary relay contact for off-delay timers, and rated for 25 cycles per hour or 100 cycles per *Day*.

- .2 Electrical supply is 230V, 1HP, 60Hz.

- .3 Operator to open doors at a rate of 610 mm (24") per second.

- .4 Entrapment Protection:

- .1 Photoelectric sensors.

- .5 Operator Controls:

- .1 Type: Push-button.

- .2 Function: operated control stations with open, close, and stop buttons for surface mounting, for interior location.

- .6 Special Operation:

- .1 *Provide* radio controlled operators, including remote operators for exterior operation of doors, as follows:

- .1 Receiver to be Chamberlain Model 412 HMC or *Equivalent*.

- .2 Remote to be Chamberlain Model 972 LMC or *Equivalent*.

## 2.8 FABRICATION

- .1 Fabricate work of this Section with materials, and with component dimensions and gauges, reinforcing, attached anchors and fastenings of adequate strength to prevent warping, buckling, opening of joints and seams, loosening of hardware, distortion, and displacement within limits of intended and specified use.

- .2 Conceal and weld connections wherever possible.

- .3 Fit joints and junctions between components tightly and in true planes.

- .4 Isolate from each other dissimilar metals, and metal from concrete or masonry to prevent electrolysis. On aluminum, use bituminous paint in concealed locations and lacquer where exposed to view.



.5 Finishing:

- .1 File and grind exposed welds smooth.
- .2 Zinc coating: clean and smooth ground surfaces at welds, fill if necessary, and prime all areas from which zinc coating has been removed with zinc rich paint applied in a minimum thickness of 0.102 mm (0.004").

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- .1 Examine building structure, finishes and conditions at the *Place of the Work*.
- .2 Notify the *Consultant* of any adverse conditions which could jeopardize system installation or system operation. Do not proceed until such conditions have been documented, assessed, rectified and approved for installation. Starting work indicates acceptance of conditions unless the *Consultant* is notified otherwise in writing.

#### **3.2 ELECTRICAL WIRING**

- .1 Power shall be brought up to circuit breaker/disconnect switch adjacent to controller under the work of Divisions 26 and 28 and in conformance with requirements specified therein.
- .2 Wiring from motor to switches, controls, starters, safety devices and other items requiring power shall be carried out under this Section.
- .3 Use Electrical Metallic Tubing (EMT) conduit for fixed wiring. Use purpose-made and approved type flexible cables or cords at applicable locations; adequately support so as not to impede access or foul moving parts of equipment.

#### **3.3 INSTALLATION – GENERAL**

- .1 *Install* sectional overhead doors and operators in accordance with door manufacturer's printed instructions.
- .2 The *Contractor* shall ensure that the work of this Section is performed by qualified personnel approved by door manufacturer.
- .3 Secure guides to steel framing members, header box to side guides and the motor to header box.
- .4 Drill and tap door frames to receive hardware. Fasten door tracks and stops to door frame by means of machine bolts; welding will not be permitted.
- .5 Fit doors snugly to edges of jambs and heads of frames. Doors shall operate smoothly and freely under all conditions of operation. Door shall sit in any position in door opening and shall not drift upward or downward.
- .6 Furnish necessary appurtenances relating to door installation, including those required on door frames.
- .7 Upon completion of installation of doors and operating equipment, lubricate moving parts prior to putting into operation. Supply oil to gear reduction units and grease sprockets, bearings, cables, link chains and door guides. Check and re-adjust as required, items of operating hardware, including weather stripping.
- .8 *Install* doors to operate freely and to close tight.

### **3.4 ADJUSTING AND CLEANING**

- .1 Adjust work of this Section to ensure free-running, tightly closing and properly counterbalanced operation. Ensure that installation is free from warp, twist or other distortion. Lubricate operating hardware.
- .2 Refinish damaged or defective work, at the *Contractor's* expense, so that no variation in surface appearance is discernible. Refinish work at the *Site* only if approved by the *Consultant*.
- .3 Clean work on completion of installation.
- .4 Adjust weather-stripping to form a weathertight seal.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

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

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 SUBMITTALS
- 1.5 CLOSEOUT SUBMITTALS
- 1.6 QUALITY ASSURANCE
- 1.7 DELIVERY, STORAGE, AND HANDLING
- 1.8 FIELD CONDITIONS
- 1.9 WARRANTY

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

- 2.1 MANUFACTURER
- 2.2 PERFORMANCE/DESIGN REQUIREMENTS
- 2.3 MATERIALS
- 2.4 ENTRANCE FRAMING
- 2.5 ALUMINUM ENTRANCE DOORS - EXTERIOR
- 2.6 ALUMINUM ENTRANCE DOORS - INTERIOR
- 2.7 ALUMINUM CURTAIN WALL
- 2.8 FINISHES
- 2.9 FABRICATION

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

- 3.1 INSTALLATION
- 3.2 AIR VAPOUR BARRIER CLOSURES
- 3.3 GLAZING
- 3.4 SEALANTS
- 3.5 HARDWARE
- 3.6 ADJUSTING AND CLEANING

### **1.3 SUMMARY**

1. Section includes:
  - .1 Aluminum entrances.
  - .2 Aluminum windows.

## 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 Further to requirements of Section 01 33 00, indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anticipated deflection under load, affected related work, weep drainage network, expansion and contraction joint location and details, field welding, coordination with hardware and electrical requirements.
  - .2 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, and provisions for thermal and structural movement between components of this section and adjacent materials.
  - .3 Include description of materials, metal finishing specifications, and other pertinent information.
  - .4 Design loads, typical reactions and support movement allowances, both vertical and horizontal, shall be placed on the shop drawings.
  - .5 Shop drawings shall clearly indicate the specification of materials and, where applicable, indicate installation methods and coordination with other sections.
  - .6 Submit framing member structural and physical characteristics, calculations, dimensional limitations, special installation requirements.
4. Samples:
  - .1 Submit samples of frame, sill and mullion sections, sill flashing and accessories, fasteners for connection of frame to opening, glazing tape, glass retainers, glazing gaskets, screening and frame, spandrel panels and each finish material and any other material, as requested.
  - .2 Samples of colour and finish prepared as specified on respective metal components for both extrusion and sheet.
  - .3 Identify samples as to treatment, thickness, alloy, framing composition, colour, manufacture, performance standard and portion of the work to which they apply.
  - .4 Fabrication shall not proceed without written acceptance of samples from the *Consultant*.
5. Test reports:
  - .1 Submit valid laboratory test reports, prepared by an independent laboratory, verifying that proposed system has been tested by an independent laboratory and achieved performance values that meet the specified performance criteria.

## 1.5 CLOSEOUT SUBMITTALS

1. Operation and maintenance data:

- .1 Submit manufacturer's operation and maintenance instructions for incorporation into the operation and maintenance manuals in accordance with Section 01 77 00.

## **1.6 QUALITY ASSURANCE**

### **1. Qualifications:**

#### **.1 Installers / applicators / erectors:**

- .1 Execute work of this section only by company who has adequate plant, equipment, and skilled workers to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified during a period of at least the immediate past 5 years.
- .2 *Provide* at least one trade specialist who shall be thoroughly trained and experienced in skills required, be completely familiar with referenced standards and requirements of this work, and personally direct installation performed under this section.
  - .1 Foreperson experience: Minimum 10 years' experience as glazing mechanic.
  - .2 Typical glazing mechanic experience: Minimum 3 years' experience as glazers.
- .3 Welding: Perform welding of structural components only by fabricators certified by Canadian Welding Bureau to CSA Welding qualification codes; CSA W47.1-09(2014) for welding of steel, and CSA W47.2-12 for welding of aluminum.

## **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 of 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 the 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.
7. Brace and protect frame units to prevent distortion and damage in shipment and handling.
8. *Provide* methods for lifting or hoisting units into place without causing damage.

## **1.8 FIELD CONDITIONS**

1. Comply with requirements of *Product* manufacturers.

## **1.9 WARRANTY**

1. This section shall assume responsibility for warranties of glass and glazing included in the work of this section, in accordance with Section 08 80 00.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURER**

1. *Work* of this section shall be provided by one of the following:
  - .1 Alumicor Limited.
  - .2 Kawneer Company Ltd.
  - .3 Or equivalent (substitutions in accordance with Section 01 25 00).

### **2.2 PERFORMANCE/DESIGN REQUIREMENTS**

1. Air Leakage; except entrance doors: Air leakage through the work shall not exceed 0.3 L/s/m<sup>2</sup> (0.06 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. Water Penetration (other than entrance doors): No water penetration shall occur when the work is tested in accordance with ASTM E331-00(2009), amended to prohibit water from passing through interior glazing seals or frame joints, at a test pressure of 300 Pa (6.24 psf).
3. Fabricate mullions to ensure under specified loads a maximum deflection of 1/175 of mullion span or 19 mm (3/4"), whichever is less.
4. Design and size components to withstand dead and live loads caused by pressure and suction of wind, acting normal to plane of system as calculated in accordance with code.
5. Design and size components to withstand seismic loads and sway displacement as calculated in accordance with code.
6. *Provide* system to accommodate, without damage to components or deterioration of seals:
  - .1 Movement within system,
  - .2 Movement between system and perimeter framing components,
  - .3 Dynamic loading and release of loads,
  - .4 Deflection of structural support framing,
7. Maintain continuous air barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound, in accordance with the *Contract Documents*.
8. Position thermal insulation to exterior of air barrier, in accordance with the *Contract Documents*.
9. Ensure no vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system occur.
10. *Provide* anchors sufficiently rigid to resist wind and snow loads caused by aluminum shades and brackets, without damage to wall system.

### **2.3 MATERIALS**

1. Aluminum extrusions: Aluminum Association alloy AA6063-T5 or T6 temper for framing.
2. Sheet aluminum: aluminum sheet, 0.92 mm (0.04") minimum thickness.

- .1 Aluminum alloy:
  - .1 AA3003-H14 Painting Quality.
  - .2 AA5005H14 Anodizing Quality.
- 3. Concealed sheet metal air barriers: 1 mm (0.04") (22 gauge) Z275 galvanized steel sheet.
- 4. Fasteners: aluminum or Type 304 stainless steel, finished to match adjacent material.
- 5. Isolation coating: alkali resistant bituminous paint or epoxy solution.
- 6. Glazing gaskets: fully resilient, shim type butyl glazing tape or EPDM glazing gasket.
- 7. Glass and other glazing materials: Refer to Section 08 80 00.
- 8. Silicone Sealant: One component, chemical curing; capable of water immersion without loss of properties: cured Shore A Durometer hardness of 15 to 25 to ASTM D2240- 05 (2010), colour as selected by the *Consultant*, where exposed, to ASTM C920-11.
- 9. Sheet metal work air barrier sealant: One component elastomeric chemical curing, to ASTM C920-11.
- 10. Air barrier membrane:
  - .1 Self-Adhesive membrane: Composite preformed modified membrane system consisting of SBS modified asphalt for low temperature flexibility and polyethylene scrim reinforcing.  
Acceptable Products:
    - .1 Bakor 'Blueskin SA' Self-Adhesive Grade Air Barrier Membrane.
    - .2 Soprema 'Sopraseal Stick 1100'.
    - .3 W.R. Meadows 'Air Shield'.
    - .4 .4 Or equivalent.
  - .2 Primer: as recommended by manufacturer.
  - .3 Membrane Properties:
    - .1 Thickness: 1.0 mm (40 mils).
    - .2 Application temperature: minimum +5°C.
    - .3 Service temperature: -40°C to +70°C.
    - .4 Elongation: 200% minimum in accordance with ASTM D412-06a (2013)- modified.
    - .5 Low temperature flexibility: to -30°C to CGSB 37-GP-56M-1985.
    - .6 Air leakage: 0.005 L/m2.s under a pressure differential of 75 Pa (0.01 PSI) in accordance with ASTM E283-04(2012).

## 2.4 ENTRANCE FRAMING

- 1. Exterior aluminum framing: 50.8 mm x 152.4 mm (2" x 6") frames and 152.4 mm x 152.4 mm (6" x 6") jambs, thermally broken extruded aluminum assembly with flush sight lines.
  - .1 Acceptable *Product*: Kawneer Tri Fab 601UT or equivalent.

2. Interior aluminum framing: 45 mm x 114 mm (1-3/4" x 4-1/2") frames and 114 mm x 114 mm (4-1/2" x 4-1/2") jambs, non-thermally broken extruded aluminum assembly with flush sight lines.
  - .1 Acceptable *Product*: Kawneer Tri Fab 450 or equivalent.
3. All section shall be designed for shear block joinery.

## 2.5 ALUMINUM ENTRANCE DOORS - EXTERIOR

1. Entrance glazing system shall be designed according to Section 08 41 00 requirements and the following:
  - .1 Doors:
    - .1 Acceptable *Product*: Kawneer '350 Medium Stile' or equivalent.
    - .2 Fasteners connecting and fixing the frame members shall be concealed.
    - .3 Reinforce mechanically-joined corners of doors by welding, spigotting, welding and spigotting or by one piece cast aluminum angle to produce sturdy door unit.
    - .4 Door stiles shall be weathered with metal backed polypropylene pile weather- stripping. *Provide* weather-stripping sweeps at door bottoms.
    - .5 Door hardware: Norton 1605 closer, 1 MS lock and 2 thumb latches (locations ass scheduled or indicated), exterior threshold 115 mm (4.5"), 1 pair butt hinges, weather stripping and Classic Hardware CO-9 with stainless steel US32 polished finish, flash cap across the top of door.
      - .1 *Provide* Unican locks where indicated or scheduled in the *Contract Documents*.
      - .2 Barrier free door operators: in accordance with Section 08 71 13.
    - .6 Weathering on offset pivot or butt hung doors (single or pairs) shall be Kawneer SEALAIR elastomeric weathering of tubular shape, with a semi-rigid polymeric backing, or equivalent.
    - .7 Door bottom rail weathering (where required) shall be an extruded elastomeric blade sweep strip applied with concealed fasteners.
    - .8 Glass: Refer to Section 08 80 00.

## 2.6 ALUMINUM ENTRANCE DOORS - INTERIOR

1. Interior entrance and interior glazing system shall be designed according to Section 08 41 00 requirements and the following:
  - .1 Doors:
    - .1 Acceptable *Product*: Kawneer '350 Medium Stile' or equivalent.
    - .2 Fasteners connecting and fixing the frame members shall be concealed.
    - .3 Reinforce mechanically-joined corners of doors by welding, spigotting, welding and spigotting or by one piece cast aluminum angle to produce sturdy door unit.
    - .4 Door stiles shall be weathered with metal backed polypropylene pile weather- stripping. *Provide* weather-stripping sweeps at door bottoms.



- .5 Door hardware: Norton 1605 closer, 1 MS lock and 1 thumb latch (locations as scheduled or indicated), 1 pair butt hinges, and Classic Hardware CO-9 with stainless steel US32 polished finish, flash cap across the top of door.
- .1 Barrier free door operators: in accordance with Section 08 71 13.
- .6 Weathering on offset pivot or butt hung doors (single or pairs) shall be Kawneer SEALAIR elastomeric weathering of tubular shape, with a semi-rigid polymeric backing, or equivalent.
- .7 Door bottom rail weathering (where required) shall be an extruded elastomeric blade sweep strip applied with concealed fasteners.
- .8 Glass: Refer to Section 08 80 00.

## 2.7 ALUMINUM CURTAIN WALL

- 1. Glass Design:
  - .1 Glass shall be designed according to CAN/CGSB 12.20-M89 and Section 08 80 00.
  - .2 Glass subjected to guard loads shall be designed with an alternative resistance path in the event of failure of one lite or ply of glass.
  - .3 Insulating glass units in accordance with Section 08 80 00.
- 2. Curtain wall shall be designed according to Section 08 41 00 requirements and the following:
  - .1 Acceptable Products:
    - .1 Alumicor 'VersaWall 2200 Series'.
    - .2 Kawneer '1620', with vertical SSG (50.8mm x 152.4mm)
    - .3 Or equivalent.
  - .2 Thermally broken sections.
  - .3 Mechanically fasten horizontal and vertical edges of infill materials and glass units with mechanically fastened continuous pressure plates complete with caps.
  - .4 Glazing cavity shall be compartmentalized at every floor level and every 6000 mm horizontally to prevent the movement of air in accordance with standard rain screen design.
  - .5 Fasteners: concealed.
  - .6 Cap extensions shall be extruded to profiles indicated and scheduled. Break- formed cap extensions will not be accepted.

## 2.8 FINISHES

- 1. Exposed aluminum surfaces; anodized to AAMA 611-98:
  - .1 Clear anodized to AA Designation AA-M12C22A41 at exterior, AA-M12C22A31 at interior.

## 2.9 FABRICATION

- 1. Sills: extruded aluminum, finished to match window frames, 15 mm (5/8") minimum projection beyond wall surface. *Provide* preformed end caps wherever sill terminates. Butt joint sill and *Provide* preformed splice connector and sealant to prevent water penetration. Locate splice

connectors (joint covers) at center line of mullions when required. Trim and detail corners neatly.

2. Make allowances for deflection of structure. Ensure that structural loads are not transmitted to aluminum work.
3. *Provide* structural steel reinforcement for strength, stiffness and connections.
4. Fit intersecting members to flush hairline weathertight joints and mechanically fasten together, except where indicated otherwise.
5. Conceal fastenings from view. Exposed fastenings where indicated.
6. Form cut-outs, recesses, mortising or milling for finishing hardware to templates supplied. Reinforce with aluminum or galvanized steel plates.
7. Field apply isolation coating to aluminum in contact with dissimilar metals and/or cementitious materials.
8. Fabricated assemblies shall make required clearances other assemblies and for deflection of structure.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

1. Install work of this section plumb, square, level, free from warp, twist and superimposed loads.
2. Secure work in required position. Do not restrict thermal movement.
3. Install hardware in accordance with templates.
4. Adjust operable parts for correct function.
5. Isolate from cementitious materials.

### **3.2 AIR VAPOUR BARRIER CLOSURES**

1. It is the responsibility of this section to give complete cooperation in providing and maintaining the continuity of air/vapour seal to adjacent materials to which the windows and frames abut. Fit flexible seals, tapes, sealants and gaskets at locations required to achieve air/vapour/water resistant and weathertight junctions. Ensure continuity of seal at end joints between lengths of material by overlapping and cementing. Caulk junctions of system components to themselves and other work with sealant to maintain effective vapour, air and water barrier and fix in place with an aluminum flat to the air/vapour seal line at the adjacent material and to the glazing rebate.
2. Where deflection of structure will cause dynamic joint movement between aluminum work and dissimilar materials, install flexible seals of sufficient width to allow formation of bellows to take up any torsional and shear stresses.

### **3.3 GLAZING**

1. Glaze aluminum framed windows and doors at exterior using insulating glazing units in accordance with Section 08 80 00.
2. Glaze interior windows and doors in accordance using glass types given in the glazing schedule and in accordance with section 08 80 00.

### 3.4 SEALANTS

1. Seal between frame members, sills and adjacent construction as a part of the work of this section and in accordance with Section 07 92 00.

### 3.5 HARDWARE

1. Install in accordance with manufacturer's installation instructions.
2. Accurately locate and adjust hardware to meet manufacturer's instructions. Use special tools and jigs as recommended.
3. Set, fit and adjust hardware according to manufacturer's directions, at heights as confirmed by the *Consultant*. Hardware shall operate freely. Protect installed hardware from damage and paint spotting.
4. At operable windows, provide hook bolt locking mechanisms (2 per window) and crank mechanism complete with T-Crank window handle (as manufactured by CR Laurence) H38xx (last two digits dependant on colour selection). Handle must not project beyond interior face of window framing so that window shades can be adjusted without interference of handle. Finish of locking and crank mechanisms shall match finish of framing.
5. Powered hardware:
  - .1 Power wiring will be supplied and installed by electrical work installer including conduit, boxes and other electrical appurtenances, including connections and terminations. Be responsible for ensuring that all wiring work is done in accordance with the Suppliers wiring diagrams and directions.
  - .2 Arrange for testing and commissioning of system by the distributor of the system. Submit a copy of reports to the *Consultant*.

### 3.6 ADJUSTING AND CLEANING

1. Cleaning on completion of installation:
  - .1 Remove deposits which affect appearance or operation of units.
  - .2 Remove protective materials.
  - .3 Clean interior and exterior surfaces by washing with clear water; or with water, and soap or detergent; followed by a clear water rinse.
  - .4 Clean and restore stained metal surfaces in accordance with manufacturer's recommendations. Replace if cleaning is impossible.
  - .5 Final cleaning is specified in Section 01 77 00.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 RELATED REQUIREMENTS**

- .1 Section 05 50 00 – Metal Fabrications
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 21 19 – Foam-In-Place Insulation
- .4 Section 07 27 13 – Modified Bituminous Air and Vapour Barrier
- .5 Section 07 27 19 – Sheet Membrane Air and Vapour Barriers
- .6 Section 07 46 46 – Fibre Cement Siding
- .7 Section 07 62 00 – Sheet Metal Flashing and Trim
- .8 Section 07 92 00 – Sealants
- .9 Section 08 80 50 – Glazing

### **1.3 REFERENCES**

- .1 Fenestration & Glazing Industry Alliance (FGIA):
  - .1 .1 AAMA 501.1-17, Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
- .2 American National Standards Institute (ANSI):
  - .1 ANSI/AAMA/WDMA 101/I.S.2/A440-11, North American Fenestration Standard/ Specification for Windows, Doors, Doors, and Skylights
  - .2 ANSI-NFRC-100-2020, Procedure for Determining Fenestration Product U-Factors.
  - .3 ANSI-NFRC-200-2020, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- .3 ASTM International (ASTM):
  - .1 ASTM A653/A653M-20, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2 ASTM D3918-11, Standard Terminology Relating to Reinforced Plastic Pultruded Products. (withdrawn)
  - .3 ASTM D4216-17 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly(Vinyl Chloride) (CPVC) Building Products Compounds.
  - .4 ASTM D4385-19, Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products.
  - .5 ASTM D4726-18, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.

- .6 ASTM E330/E330M-14 (2021), Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .7 ASTM E331-00(2016), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, Curtain Walls by Uniform Static Air Pressure Difference.
- .8 ASTM E1105-15, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- .9 ASTM E1300-16, Standard Practice for Determining Load Resistance of Glass in Buildings.
- .10 ASTM F588-17, Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
- .4 Canadian Standards Association Group (CSA):
  - .1 CSA Plus A440H-14, User Guide o AAMA/WDMA/CSA 101/I.S.2/A440 NAFS 2011 - North Fenestration Standard/Specification for Windows, Doors, and Skylights.
  - .2 CSA A440S1-19, Canadian Supplement to AAMA/WDMA/CSA 101/1.S.2/A440-17, NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.
  - .3 CSA A440.2-19/A440.3-19, Fenestration energy performance/User guide to CSA A440.2-19, Fenestration energy performance.
  - .4 CAN/CSA A440.4-19, Window, Door, and Skylight Installation.
  - .5 CSA G164-18 Hot Dip Galvanizing of Irregularly Shaped Articles.
- .5 .5 Fenestration and Glazing Industry Alliance (FGIA):
  - .1 TM-3000-90(16), Glazing Guidelines for Sealed Insulating Glass Units.
- .6 Glass Association of North America (GANA):
  - .1 GANA Glazing Manual 50th Anniversary Edition.
- .7 Insulating Glass Manufacturer's Alliance (IGMA):
  - .1 TM-3000-90(04), Glazing Guidelines for Sealed Insulating Glass Units.
- .8 National Fenestration Rating Council (NFRC):
  - .1 NFRC 100-2014, Procedure for Determining Fenestration Product U-factors.
  - .2 NFRC 100A-2014, Procedure for Determining Fenestration Attachment Product U-factors.
  - .3 NFRC 200-2014, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
  - .4 NFRC 200A-2014, Procedure for Determining Fenestration Attachment Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
  - .5 NFRC 400-2017, Procedure for Determining Fenestration Product Air Leakage
  - .6 NFRC 500-2014, Procedure for Determining Fenestration Product Condensation Resistance Values.
- .9 Window and Door Manufacturers Association (WDMA):

- .1 ANSI/AAMA/NWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
- .2 ANSI/AAMA/NWDA 101/I.S.2/NAFS-02 - Voluntary Performance Specification for Windows, Skylights and Glass Doors.
- .3 WDMA I.S.4 - Industry Standard for Water-Repellent Preservative Non-Pressure Treatment for Millwork.

#### **1.4 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS**

- .1 Submit the following in accordance with Section 01 11 00 – General Requirements, Submittal Procedures.
  - .1 Submit manufacturer's product data including construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of window indicated.
  - .2 Submit copies of test reports to establish that the products assembled by this manufacturer comply with the specified Performance Class, Performance Grade, Water Test Pressure, and Air Infiltration/Exfiltration Level as tested to NAFS-11 and the Canadian Supplement. Submit complete test reports showing all component drawings.
  - .3 Submit shop drawings including plans, elevations, large scale sections and details, hardware, attachments to other work, operational clearances, and the following:
    - .1 Sections details showing window perimeter conditions.
    - .2 Mullion details and frame corner connections, including reinforcement and stiffeners.
    - .3 Joinery and frame anchorage to wall structure details.
    - .4 Flashing and drainage details, sill flashing terminations, in isometric view, including coordination with wall cladding materials.
    - .5 Connection to air and vapour retarder membrane.
    - .6 Weather stripping details showing air sealing within and around perimeter of framing and operable sash.
    - .7 Glazing details.
    - .8 Required sizes and tolerances of openings.
  - .4 Submit product test reports indicating compliance with CSA A440.1 based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of window indicated for the project; test results based on use of down sized test units will not be accepted.
  - .5 Provide Tests in Accordance with Section 01 11 00 – General Requirements, Quality Control:
    - .1 Static Pressure Air Exfiltration Smoke Test, provide one test.
    - .2 Static Pressure Water Infiltration: ASTM E331 Standard Test Method for Water Penetration by Uniform Static Air Pressure Difference. A minimum 15 minute wait period shall be included after this and each subsequent water penetration test.
    - .3 Dynamic Pressure Water Infiltration: AAMA 501.1 Standard Test Method for Exterior for Water Penetration using Dynamic Pressure. Include two setups.

- .6 Provide a letter from window manufacturer identifying compliance with CSA A440 Design Criteria, ASTM D4216 and ASTM D4726.
- .2 Submit maintenance data in accordance with Section 01 11 00 – General Requirements, Closeout Submittals.
  - .1 Provide manufacturer's printed recommendations for maintenance, including cleaning instructions.
- .3 Manufacturers' Field Reports: submit copies of manufacturers field reports.

## **1.5 QUALITY ASSURANCE**

- .1 Qualifications
  - .1 Manufacturer qualifications: company specializing in manufacturing the products specified in this section.
  - .2 Installer qualifications: company specializing in performing the work of this section and approved by manufacturer.
- .2 Single-Source Responsibility: obtain windows from a single manufacturer regularly engaged in the manufacturing and supply of the specified products, meeting or exceeding the material properties and performance characteristics of the materials and manufacturers named in this Section.

## **1.6 DELIVERY, STORGE, AND HANDLING**

- .1 Packaging Waste Management
  - .1 Separate and recycle waste materials in accordance with Section 01 11 00 – General Requirements, Waste Management and Disposal.

## **1.7 WARRANTY**

- .1 Provide ten year warranty on performance, seal, parts and finishes

## **PART 2 – PRODUCTS**

### **2.1 WINDOW TYPE AND CLASSIFICATION**

- .1 Type:
  - .1 Casement: with removable double glazing insulating glass.
  - .2 Awning: with removable double glazing insulating glass.
  - .3 Fixed: with removable double glazing insulating glass.
  - .4 Screens: on ventilating portion of windows as indicated.

### **2.2 MATERIALS**

- .1 Classification rating: to AAMA/WDMA/CSA 101/I.S. 2/A440-11 (NAFS-11) AND CSA A440S1 CANADIAN SUPPLEMENT TO NAFS-11.
  - .1 Performance Class: LC.
  - .2 Performance Grade: PG45

- .3 Air Leakage: Fixed and A2
- .4 Water Penetration Test Pressure: minimum 290 Pa
- .5 Forced Entry: F1
- .6 Insect Screens: S2.
- .2 Main Frame and Full Sash: Polyvinyl chloride (PVC): to ASTM D4216, Class 1-10154-33-0101, 1-20131-33-0101 or 1-40121-33-0101.
- .3 Insulated Glazing Units: as indicated in Section 08 80 50 - Glazing
- .4 Metal sills of type and size to suit job conditions; minimum 3 mm thick, complete with joint covers, jamb drip deflectors, chairs, anchors.
- .5 Isolation coating: alkali resistant bituminous paint.

## **2.3 FABRICATION**

- .1 Fabricate in accordance with CSA-A440/A440.1 supplemented as follows:
- .2 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.
- .3 Face dimensions detailed are maximum permissible sizes.
- .4 Brace frames to maintain squareness and rigidity during shipment and installation.
- .5 Finish steel clips and reinforcement with shop coat primer to CAN/CGSB-1.40 380 g/m<sup>2</sup> zinc coating to CSA-G164.

## **2.4 FINISHES**

- .1 Coloured Anodized Finish: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M12C22A44, colours to match Kawneer #29 – Black
- .2 Enamel coating: in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, including appendices, supplemented as follows:
  - .1 Colour: Black exterior, white interior.
- .3 Unexposed aluminum: Mill finish.
- .4 Vinyl finishes: in accordance with CSA-A440/A440.1, including appendices.

## **2.5 ISOLATION COATING**

- .1 Isolate aluminum from following components, by means of isolation coating:
  - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
  - .2 Concrete, mortar and masonry.
  - .3 Wood.

## **2.6 ACCESSORIES**

- .1 Steel Reinforcement: sheet steel to ASTM A653M, hot dip galvanized, minimum Z275 coating designation.



- .2 Joint Sealants: as specified in Section 07 92 00 - Sealants, as recommended for types of substrates.
- .3 Screens: standard duty, Class A, aluminum mesh 18 x 16/25 mm with extruded aluminum sash and four metal clip or screw retainers per side. Screen sash finish shall match colour of window sash.
  - .1 Fasteners: tamper proof.
  - .2 Mount screen frames for interior replacement.
- .4 Insulating Foam Sealant: one-part polyurethane, closed cell foam, skin-forming type, expanding maximum 25%.
- .5 Foam Backer Rod: extruded closed cell backer rod, oversize 30 to 50
- .6 Weatherstripping at Operable Sash: neoprene, thermoplastic rubber or EPDM, flexible at minimum design temperature, and as follows:
  - .1 Profiled to mechanically key into window frame and operable sash.
  - .2 Removable without special tools and without dismantling of sash or frame.
  - .3 Designed to maintain pressure contact against sash through design temperature range.
- .7 Flashing: prefinished sheet aluminum, brake formed as indicated on drawings, 0.62 mm thick, or extruded vinyl matching window framing, concealed fastened.

## **2.7 AIR BARRIER AND VAPOUR RETARDER**

- .1 Equip window frames with site installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as indicated in Section 07 27 13 – Modified Bituminous Air and Vapour Barrier and 07 27 19 – Sheet Membrane Air and Vapour Barrier.

## **PART 3 – EXECUTION**

### **3.1 EXAMINATION**

- .1 Inspect Work and conditions affecting the Work of this Section. Proceed only after deficiencies have been corrected.
- .2 Ensure that flashings are built-in or integrated with system to divert moisture to exterior.
- .3 Ensure that all anchor blocks or inserts required to receive system are correctly located and installed.
- .4 Ensure that all anchors and setting or installing components provided by this Section for installation are properly located and installed.
- .5 Ensure that building air and vapour retarding membranes can be sealed to window units to maintain system integrity. Coordinate with materials installation specified in Section 07 21 19 – Foam-In-Place Insulation and Section 07 27 19 – Sheet Membrane Air and Vapour Barriers.

### **3.2 INSTALLATION**

- .1 Compliance
  - .1 Install windows to CAN/CSA A440.4, and as required to meet specified performance design criteria.

- .2 Comply with manufacturer's installation instructions, standard details and data sheets.
- .2 Erect and secure window units in prepared openings, plumb and square, free from warp, twist or superimposed loads.
- .3 Mount with exterior surface of frame flush with exterior sheathing.
- .4 Secure work accurately to structure and in a manner not restricting thermal movement of materials.
- .5 Transfer dead load to wall construction by anchors alone or in combination with plastic shims.
- .6 Place shims under sill frame at setting block locations, and as recommended by manufacturer.
- .7 Conceal anchors and fitments; exposed heads of fasteners are not permitted.
- .8 Maintain dimensional tolerances after installation and alignment with adjacent work.
- .9 Provide seal around interior perimeter of frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant.
- .10 Provide seal at head and jamb of exterior perimeter of frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant. Do not seal sill at exterior.
- .11 Install jamb extensions, casings, brick moulds and trim as indicated on Drawings, or as otherwise required for a complete installation.
- .12 Install sealant, in accordance with Section 07 92 00 - Sealants, and related materials as indicated on drawings.
- .13 Provide field testing and results as indicated and confirmation that thermal performance values are achieved and as follows:
  - .1 On-site tests for water infiltration will be conducted with window manufacturer's representative present. Owner's representative will select units to be tested.
  - .2 Test the installed water penetration resistance of the products, to ASTM E1105 Procedure B at the water penetration resistance test pressure of 290Pa Test window including perimeter joint and interface with adjacent building construction.
  - .3 There shall be no water penetration as defined by Clause 5.4 of CSA A440S1-09. Water droplets that are retained within the system due to surface tension do not constitute a failure provided they are not retarding drainage or ventilation of the cavity.
  - .4 Correct deficiencies in units that fail to meet specified requirements, and units having similar deficiencies. Defective units to be retested.
  - .5 The Owner will pay the cost for the original test. Costs for retests, and for repair work to defective units, to be paid by the responsible contractor
- .14 Adjust operable sash and hardware to operate smoothly.
- .15 Clean interior and exterior surfaces as soon as adjacent contaminating activities are completed to recommendations of manufacturer.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 References
- .5 1.5 Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Delivery, Storage and Handling
- .8 1.8 Coordination
- .9 1.9 Warranty
- .10 2.1 Manufacturers
- .11 2.2 Materials
- .12 2.3 Hanging Devices
- .13 2.4 Flush Bolts and Accessories
- .14 2.5 Cylinders and Keying
- .15 2.6 Locking Devices
- .16 2.7 Electric Strikes
- .17 2.8 Exit Devices
- .18 2.9 Automatic Door Operators
- .19 2.10 Door Closers
- .20 2.11 Door Trim and Protective Plates
- .21 2.12 Door Stops and Holders
- .22 2.13 Gasketing and Thresholds
- .23 2.14 Silencers
- .24 2.15 Sliding Door Track
- .25 2.16 Electronic Products and Accessories
- .26 2.17 Finishes
- .27 3.1 Examination
- .28 3.2 Preparation
- .29 3.3 Installation
- .30 3.4 Field Quality Control
- .31 3.5 Adjusting
- .32 3.6 Cleaning And Protection
- .33 3.7 Demonstration

### 1.3 SUMMARY

- .1 Related documents
  - .1 *Drawings* and general provisions of the *Contract*, including General and Supplementary Conditions and Division 01 *Specification* Sections, apply to this Section.
- .2 Section includes
  - .1 Furnishing of all items of finish hardware as hereinafter specified or obviously necessary for all swinging, sliding, folding and other doors as indicated in the Contract Documents. Except, items which are specifically excluded from this Section of the specification or are of unique hardware specified in the same Sections as the doors and frames on which they are installed.
- .3 Related sections
  - .1 06 40 00 – Architectural Woodwork
  - .2 08 11 13 – Steel Doors and Frames
  - .3 08 35 13 – Four-Fold Metal Doors
  - .4 08 36 13 – Sectional Overhead Metal Doors
  - .5 08 41 00 – Aluminum Framed Glazing
  - .6 08 71 13 – Automatic Door Operators
  - .7 28 00 00 – Security System

### 1.4 REFERENCES

- .1 Codes and standards
  - .1 ANSI A117.1 – Accessible and Usable Buildings and Facilities
  - .2 ANSI A156.1 – Butts and Hinges
  - .3 ANSI A156.3 – Exit Devices
  - .4 ANSI A156.4 – Door Controls – Closers
  - .5 ANSI A156.5 – Cylinders and Input Devices for Locks
  - .6 ANSI A156.6 – Architectural Door Trim
  - .7 ANSI A156.7 – Template Hinge Dimensions
  - .8 ANSI A156.8 – Door Controls – Overhead Stops and Holders
  - .9 ANSI A156.9 – Cabinet Hardware
  - .10 ANSI A156-10 – Power Operated Pedestrian Doors
  - .11 ANSI A156.11 – Cabinet Locks
  - .12 ANSI A156.12 – Interconnected Locks
  - .13 ANSI A156.13 – Mortise Locks and Latches Series 1000
  - .14 ANSI A156.16 – Auxiliary Hardware

- .15 ANSI A156.18 – Materials and Finishes
- .16 ANSI A156.19 – Power Assist and Low Energy Power Operated Doors
- .17 ANSI A156.21 – Thresholds
- .18 ANSI A156.22 – Door Gasketing and Edge Sealing Systems
- .19 ANSI A156.25 – Electrified Locking Devices
- .20 ANSI A156.26 – Continuous Hinges
- .21 ANSI A156.28 – Recommended Practices for Mechanical Keying Systems
- .22 ANSI A156.29 – Exit Locks, Exit Alarms, Alarms for Exit Devices
- .23 ANSI A156.30 – High Security Cylinders
- .24 ANSI A156.31 – Electric Strikes and Frame Mounted Actuators
- .25 ANSI A156.32 – Integrated Door Opening Assemblies
- .26 ANSI A156.36 – Auxiliary Locks
- .27 ANSI A250.4 – Steel Doors and Frames Physical Endurance
- .28 NFPA 80 – Standard for Fire Doors and Other Opening Protectives
- .29 NFPA 101 – Life Safety Code
- .30 OBC 2006 – Ontario Building Code
- .31 SDI 122-07 – Installation and Troubleshooting Guide for Standard Steel Doors and Frames
- .32 Door and Hardware Institute Publication – Sequence and Format for the Hardware Schedule (1996)
- .33 Door and Hardware Institute Publication – Keying Systems and Nomenclature (1989)

## 1.5 SUBMITTALS

- .1 General requirements
  - .1 Submit all documentation and samples in accordance with Division 01, General Requirements.
- .2 Schedules and data
  - .1 *Product Data*: Manufacturer's *Product* data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
  - .2 Door Hardware Schedule: Prepared and submitted within 14 Working *Days* of receipt of purchase order by or under the supervision of supplier and coordinated with all *Drawings* and related documents to ensure; size, thickness, hand, function, finish and application of hardware. All approved hardware changes shall be incorporated in the hardware schedule and kept current throughout the duration of the *Project*.
    - .1 Format: Vertical format and sequence as detailed in the Door and Hardware Institute (DHI) publication "Sequence and Format for the Hardware Schedule".

- .2 Content: Include the following information for each opening:
  - .1 Location of each hardware set cross-referenced to identifying mark(s) on Architectural floor plans and in door and frame schedule included in the Contract Drawings.
  - .2 Handing and degree of swing of each door.
  - .3 Keying information.
  - .4 Quantity, type, style, function, size and finish of each hardware item.
  - .5 Complete methods of operation for all openings containing electronic components with detailed operational descriptions of each item's function(s) during all typical conditions and ingress/egress situations.
  - .6 Elevation drawings of all openings with electronic hardware systems identifying locations of components, conduit, back boxes, junction boxes and miscellaneous system requirements.
  - .7 Name and manufacturer of each hardware item.
  - .8 Fastenings and other pertinent installation information.
  - .9 Hardware mounting locations when different from standard.
- .3 Samples: *Provide* each type of hardware in finish indicated in the *Contract Drawings* as requested. Items will be returned in original packaging and working order to the *Contractor* to be incorporated into the *Project* scope of *Work*.
- .4 Templates: Furnish a complete, indexed list with templates and finish hardware schedule to the Contractor for each trade supplying materials requiring hardware preparations.
- .5 Electronic hardware systems:
  - .1 Wiring Diagrams: Prepared and submitted within 10 *Working Days* of receipt of purchase order by or under the supervision of *Supplier* and coordinated with all *Drawings* and related documents to ensure accurate function and coordination.
  - .1 Elevations: *Provide* diagrams for each unique opening with electronic hardware components identifying individual item locations, conduits, back boxes, junction boxes and miscellaneous system requirements and devices.
  - .2 Risers: *Provide* diagrams detailing locations and infrastructure between door openings, power supplies, access control panels and system components.
  - .3 Point to Points: *Provide* diagrams detailing wiring terminations at all electrified devices as applicable to function of all openings. (inclusion depending on installation)
  - .4 Responsibility matrix: *Provide* documentation for approval detailing basic responsibilities inclusive of all related Sections involved in the preparation for, installation and commissioning of electrified systems.
- .6 Keying Schedule: Prepare a separate schedule, in accordance with DHI publication "Keying Systems and Nomenclature", detailing final keying instructions for all locksets and cylinders. Include; keying system explanation, door numbers, keyset symbols, hardware set numbers, and special instructions. The *Owner* to approve submitted keying schedule prior to the ordering of permanent cylinders.

- .7 Operations and Maintenance Manuals: *Provide* operating and maintenance manuals in accordance with Division 01, Section 01 77 00 - Contract Closeout Procedures and Submittals and 01 78 23 Operation and Maintenance Manuals. Manuals must include; complete manufacturer and distributor contact information, manufacturers documentation for care and maintenance of all *Products* and finishes, manufacturers *Product* parts lists, manufacturers installation and adjustment instructions, manufacturers/service representatives warranty documentation, and 'as built' copies of all submittal documentation.
- .8 Warranties and Maintenance Agreements; *Provide* manufacturers/service representatives special warranties and maintenance agreements specified in this Section.

## 1.6 QUALITY ASSURANCE

- .1 Substitutions
  - .1 Refer to Section 01 25 00 – Product Substitution Procedures.
- .2 *Supplier* qualifications
  - .1 A recognized Architectural door hardware *Supplier* who has maintained an office and has minimum of five years' documented experience in providing consulting services and supplying mechanical and electromechanical hardware comparable in material, design and extent to that required for this *Project*.
  - .2 Have an office and warehouse facilities to accommodate this *Project*.
  - .3 Authorized factory distributor in good standing of all *Products* specified in this Section.
  - .4 Have in their employment a minimum of one Architectural Hardware *Consultant* (AHC) as administered and certified by The Door and Hardware Institute, Chantilly VA or *Equivalent* certification. AHC shall be responsible for preparation of finish hardware/keying schedules.
- .3 Installer qualifications
  - .1 Trained by the primary *Product* manufacturers with a minimum of five years' documented experience in the installation of both mechanical and electromechanical hardware comparable in material, design and extent to that required for this *Project*.
- .4 Source limitations
  - .1 Electrified modifications and enhancements made to a source manufacturer's *Product* line by a secondary or third party source will not be accepted.
  - .2 *Provide* electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated in the *Contract Documents*.
- .5 Fire-rated openings
  - .1 *Provide* door hardware for fire-rated openings that complies with NFPA 80 and requirements of the *Authorities Having Jurisdiction*. *Provide* only items that are listed/labelled by Underwriter's Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.
- .6 Keying conference
  - .1 Conduct conference to comply with requirements in Division 01, Section 01 31 19 - Project Meetings. Keying conference to incorporate the following criteria into the final keying schedule document:

- .1 Function of building, purpose of each area and degree of security required.
  - .2 Plans for existing and future key system expansion.
  - .3 Requirements for key control storage and software.
  - .4 Installation of permanent keys, cylinder cores and software.
  - .5 Address and requirements for delivery of keys.
- .7 Pre-submittal conference
- .1 Conduct conference to comply with requirements in Division 01, Section 01 31 19 -Project Meetings, with attendance by representatives of *Supplier(s)*, installer(s) and *Subcontractor(s)* to review proper methods and the procedures for receiving, handling and installing door hardware.

## 1.7 DELIVERY, STORAGE AND HANDLING

- .1 Marking and packaging
- .1 Mark items according to the approved hardware schedule indicating hardware set and door number.
  - .2 Items to be sorted, verified and repackaged in manufacturer's original packaging complete with necessary screws, accessories, templates, installation instructions and any specialized tools required for installation.
- .2 Delivery
- .1 The *Contractor* shall ensure that delivery times for receipt of door hardware are acceptable to the *Consultant*. The *Contractor* shall check deliveries against accepted list and *Provide* written acceptance assuming responsibility for storage and care. Immediately identify any shortages or damaged items in writing.
  - .2 The *Contractor* shall ensure that hardware items are jointly inventoried on *Site* by representatives from hardware *Supplier*, installer and relevant *Subcontractor*.
  - .3 Deliver permanent keys, cylinders, cores, access control credentials, software and related accessories directly to the *Owner* via registered mail or as established at the 'Keying Conference'.
  - .4 Do not store electronic access control hardware, software or accessories at the *Site* without prior authorization.
  - .5 Construction master keys to be separately packaged from all other items and delivered to *Owner* as previously coordinated.
- .3 Storage
- .1 The *Contractor* shall *Provide* a clean, dry and secure hardware storage room with adequate shelving to layout each item by door number and hardware set number. Room size, location and layout to be jointly coordinated with hardware *Supplier*, installer and *Subcontractor*.

## 1.8 COORDINATION

- .1 Obtain and distribute templates for doors, frames and other work specified to be factory prepared for installing standard and electrified hardware. Review *Shop Drawings* of related Sections to ensure that adequate provisions and modifications are made for locating and installing hardware.



- .2 Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required power connections, conduit, fire alarm connections, junction boxes, back boxes, reinforcing and mounting locations for low voltage power supplies, detection/monitoring hardware, power transfer devices and all other listed components.
- .3 Coordination meetings:
  - .1 The *Contractor* shall ensure that hardware *Supplier* meets with the *Owner*, the *Consultant*, the electrical *Subcontractor*, security contractor and Access Control *Subcontractor* to review, coordinate and implement all details relating to the proper operation and location of all electronic hardware prior to start of construction. Review methods of operation for each unique opening with electrified components.
  - .2 Conduct a *Project* specific training meeting to instruct the installation *Subcontractor's* personnel on the proper installation and adjustment of all *Products*. *Product* training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates, physical *Product* samples as required and review of method of operation for electrified openings.
  - .3 Inspect and review electrical rough-ins, power supply connections and all other applicable work by related trades.
  - .4 Review and finalize construction schedule and verify material availability.
  - .5 Review the required inspection, testing, commissioning and demonstration procedures.
- .4 Upon completion of installation, *Provide* written documentation that components were applied as per manufacturer's instructions and recommendations according to the approved hardware schedule. Identify any defective or damaged materials.

## 1.9 WARRANTY

- .1 General Warranty in accordance with Division 01, General Requirements and Article A-15 of the Agreement Between *Owner* and *Contractor*. Special warranties specified in this article shall not deprive the *Owner* of other rights under other provisions of the *Contract Documents* and shall be in addition to, and run concurrent with other warranties made by the *Contractor* under requirements of the *Contract Documents*.
- .2 Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period of two years as specified in Article A-15 of the Agreement Between *Owner* and *Contractor*. Failures include, but are not limited to:
  - .1 Structural failures including excessive deflection, cracking, or breakage.
  - .2 Faulty operation of hardware.
  - .3 Deterioration of metals, finishes and other materials beyond normal weathering.
  - .4 Electrical component defects and failures within system operation.
- .3 Extended warranty periods:
  - .1 Hinges - Lifetime
  - .2 Mortise Locksets – Seven (7) years

- .3 Exit Devices – Five (5) years
- .4 Door Closers – Ten (10) years
- .5 Electric Strikes – Five (5) years
- .6 Electromechanical Locksets – Two (2) years
- .7 Electromagnetic Locks – Lifetime
- .8 Power Supplies - Lifetime

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- .1 Manufacturers as listed below have been determined as the acceptable standard. Obtain each type of finish hardware (hinges, latch and locksets, exit devices, door closers, etc.) From a single manufacturer.

### 2.2 MATERIALS

- .1 Screws and fasteners
  - .1 All required screws shall be supplied as necessary for securing finish hardware in the appropriate manner. Thru-bolts shall be supplied for exit devices and door closers where required by code and the appropriate blocking or reinforcing is not present in the door to preclude their use.

### 2.3 HANGING DEVICES

- .1 Hinges
  - .1 Hinges shall conform to ANSI A156.1 and have the number of knuckles as specified, oil-impregnated bearings as specified with NRP (non-removable pin) feature, at all exterior and interior locked reverse bevel doors. Unless otherwise scheduled, supply 2 hinges for doors up to 60" (1520mm) in height and supply one (1) additional hinge for every 30" (760mm) of door height or part thereof. Hinges shall be sized per the manufacturer's recommendations. Hinges shall be a minimum of 4 1/2" high and 4" wide; heavy weight hinges (.180) shall be supplied at all doors where specified in the *Contract Documents*.
  - .2 Provide hinge size to comply with the following:

Door Width	Hinge Height	Hinge Width
Up to 36"	4-1/2"	4"
Over 36"	5"	4-1/2"
Up to 48"	5"	5"
Over 48"	6"	6"

- .1 Specified Manufacturer: McKinney TA/T4A Series or *Equivalent*
- .2 Electric hinges
  - .1 Electric hinges shall be provided with Molex standardized plug connectors to accommodate up to 12 wires. Plug connectors shall plug directly into Molex through-door wiring harnesses for connection to electric locking devices and power supplies. *Provide* sufficient number of concealed wires to accommodate electric function of specified hardware. *Provide* a mortar guard for each electric hinge specified in Contract Documents.

- .1 Specified Manufacturer: Assa Abloy McKinney or Markar - QC Series or *Equivalent*
- .3 Continuous geared hinges
  - .1 All hinges to be non-handed and completely reversible. Hinge line to be available in concealed flush mount with or without inset, full surface and half surface types as specified in the hardware sets. All hinges to be made of extruded 6060 T6 aluminum alloy with polyacetal thrust bearings, anodized after cutouts are made for bearings. All concealed hinges to be fire-rated for 20, 45 and 90 minutes when incorporated into proper door and frame labeled installations, without necessitating the use of fusible-link pins. All concealed hinges to be available in standard, heavy, and extra heavy duty weights; all full surface and half surface hinges in standard and heavy duty weights as specified in the hardware sets. All hinges to be factory cut for door size.
    - .1 Specified Manufacturers: Assa Abloy McKinney
    - .2 Or *Equivalent*. Refer to Section 01 25 00 – Product Substitution Procedures.

## 2.4 FLUSH BOLTS AND ACCESSORIES

- .1 All manual and automatic flush bolts to be furnished as specified.
  - .1 Specified Manufacturer: Assa Abloy Rockwood
  - .2 Or *Equivalent*. Refer to Section 01 25 00 – Product Substitution Procedures

## 2.5 CYLINDERS AND KEYING

- .1 Cylinders
  - .1 All Permanent Cylinders are to be Schlage Large Format Interchangeable Core.
    - .1 Specified Manufacturer: Schlage IFIC C keyway
    - .2 Or *Equivalent*. Refer to Section 01 25 00 – Product Substitution Procedures
- .2 Keying
  - .1 Permanent Cores to be Master keyed & keyed Different at the factory.
  - .2 Furnish the Cylinders directly to the *Owner*. The *Owner* will rekey the cylinders to their requirement.
  - .3 The *Contractor* shall remove all construction cores and install all permanent cores, unless otherwise directed by the *Owner*.
  - .4 Pack all permanent cylinders and keys separately from locksets. Identify door number and keyset symbol on each envelope.
  - .5 Ship the control keys directly to the *Owner* unless directed otherwise.
  - .6 Furnish the following:
    - .7 Two change keys per lock.
    - .8 I/C Core – four construction control keys and four permanent control keys.
    - .9 15 construction keys.

- .10 The construction keys are to be shipped separate from the locksets, directly to the *Contractor*.

- .3 Key cabinet

- .1 *Provide* a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall expansion capacity of 150% of the number of locks required for the project. The *Contractor* shall ensure that the hardware *Supplier* assists the *Owner* with the set up of the key cabinet.

- .1 Specified Manufacturer: Telkee AWC Series or *Equivalent*.

## 2.6 LOCKING DEVICES

- .1 Mortise locksets

- .1 All locksets shall be ANSI 156.13 Series 1000, Grade 1 Certified. All functions shall be manufactured in a single sized case formed from 12 gauge steel minimum. The lockset shall have a field-adjustable, beveled armored front, with a .125" minimum thickness and shall be reversible without opening the lock body. The lockset shall be 2 3/4" backset with a two-piece 3/4" anti-friction stainless steel latchbolt. The deadbolt shall be a full 1" throw made of stainless steel and have 2 hardened steel roller inserts. All strikes shall be non-handed with a straight lip. To ensure proper alignment, all trim, shall be thru-bolted and fully interchangeable between rose and escutcheon designs and shall be the product of one manufacturer.

- .1 Specified Manufacturer: Corbin Russwin Inc. ML2000 Series or *Equivalent*.

- .2 Electrified locksets

- .1 Mechanical features of locksets shall conform to standards as specified above. Locksets shall be fail-secure unless otherwise specified. Where specified electrified locksets shall be provided with a switch to monitor inside or outside lever handle or signal remote location. *Provide* an in-line power controller with all electrified locksets.

- .1 Specified Manufacturer: Corbin Russwin Inc. or *Equivalent*.

- .3 Lockset strikes

- .1 Strikes shall be non-handed and straight lip. *Provide* strikes with lip-length required to accommodate jamb and/or trim detail and projection.

## 2.7 ELECTRIC STRIKES

- .1 Standard strikes

- .1 All standard electric strikes shall meet BHMA standard 501, grade 1 and be UL Listed for Burglary Resistance, category 1034. Strikes shall be all stainless steel construction for corrosion resistance, strength and durability. Strikes shall have been tested to withstand a forcing strength of a minimum 2400 lbs. before releasing and perform with a minimum of one million cycles of operation. Strikes shall be 24VDC fail-secure unless otherwise specified in the *Contract* documents. *Provide* an in-line power controller with all electric strikes.

- .1 Specified Manufacturers: Assa Abloy HES 1006 Series or *Equivalent*.

- .2 Surface mounted strikes

- .1 All surface mounted electric strikes shall meet BHMA standard 501, grade 1 and be UL Listed for Burglary Resistance, category 1034. Strikes shall have two heavy-duty, stainless steel locking mechanisms operating independently to *Provide* tamper resistance. Optional latchbolt and latchbolt strike monitoring that indicates position of the latchbolt and locked condition of the strike shall be available. Strikes shall have been tested for a minimum of 500,000 operating cycles. *Provide* an in-line power controller with all electric strikes.
- .1 Specified Manufacturers: Assa Abloy HES 9500(Fire Rated) HES 9600(non-Rated) or *Equivalent*.

## **2.8 EXIT DEVICES**

- .1 Conventional devices – push rail
  - .1 All exit devices shall be ANSI A156.3, Grade 1 Certified and shall be listed by Underwriters Laboratories and bear the UL label for life safety in full compliance with NFPA 80 and NFPA 101. Mounting rails shall be formed from a solid single piece of stainless steel, brass or bronze no less than 0.072" thick. Push rails shall be constructed of 0.062" thick material. Painted or anodized aluminum shall not be considered heavy duty and is not acceptable. Lever trim shall be available in finishes and designs to match that of the specified locksets.
  - .1 Specified Manufacturer: Von Duprin 99/33 Series or *Equivalent*.
- .2 Electrified devices
  - .1 Electrified exit devices shall conform to all traditional exit device standards. All power requirements for exit devices used must utilize a continuous circuit electric hinge for clean design and no visible means of interrupting power to device.
  - .2 All exit devices, both fire labeled and non-labeled devices, requiring electric dogging shall be held in the "dogged" or retracted position. All exit devices with electric latch retraction shall *Provide* for a remote means of unlocking for momentary or maintained periods of time.
  - .3 Where specified exit devices shall be provided with a switch to monitor push rail or signal remote location and latchbolt monitoring.
  - .4 *Provide* a 782 Series Controller from Corbin Russwin Inc. with all Electric Latch Retraction devices or *Equivalent*.

## **2.9 AUTOMATIC DOOR OPERATORS**

- .1 All operators shall be ANSI 156.19, Grade 1 Certified. Units shall have adjustments for door closing force and backcheck, motor assist from 0 to 30 seconds, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay up to 30 seconds. Operator units shall *Provide* conventional door closer opening and closing forces unless the power operator motor is activated by an initiating device with door closer assembly having adjustable spring size, backcheck valve, sweep valve, latch valve, speed control valve, and pressure adjustment valve to control door closing. Operators shall have push and go function to activate power operator or power assist functions. Units shall have a presence detector input to prevent a closed door from opening or a door that is fully opened from closing and shall have a hold open toggle input to allow remote activation for indefinite hold open; door shall close the second time the input is activated. Operators shall have a SPDT relay for interfacing with latching or locking devices. All controlling operator switches shall be of radio- frequency design and not hard-wired.

- .1 Specified Manufacturer: Assa Abloy BESAM SW200i(exterior) BESAM SW100(interior) or *Equivalent*.

## **2.10 DOOR CLOSERS**

- .1 Surface mounted closers – heavy duty

- .1 All door closers shall be ANSI 156.4, Grade 1 Certified. All closers shall have aluminum alloy bodies, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to *Provide* up to 50% increase in spring power. Closers shall be furnished with parallel arms mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

- .1 Specified Manufacturer: Yale Security Inc. Norton 7500 Series or *Equivalent*.

- .2 Surface mounted closers – standard duty

- .1 All door closers shall be ANSI 156.4, Grade 1 Certified. All closers shall have aluminum alloy bodies, forged steel arms, and separate valves for adjusting backcheck, closing and latching cycles and adjustable spring to *Provide* up to 50% increase in spring power. Closers shall be furnished with parallel arms mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

- .1 Specified Manufacturer: Yale Security Inc. Norton 8500 Series or *Equivalent*.

## **2.11 DOOR TRIM AND PROTECTIVE PLATES**

- .1 Door Pulls/Push/Kick/Armour Plates: to be 0.050 inches thick and 1.5 inches less full width of door, or as specified. Furnish all push/kick and armour plates with 'B4E' beveled edges. Where door pulls and push plates are specified countersink door pull throughbolts in door for flush fit and apply push plates over top of throughbolts. Follow specific mounting instructions where push plate, door pull and deadlock applications occur. Fasteners for push plates, pull plates, door pulls and miscellaneous door trim shall be as shown in the hardware schedule. Where full height door pulls are specified supply units less 150mm from the top of door and 300mm from bottom of door. Submit shop drawing of pulls for review.

- .1 Specified Manufacturer: Assa Abloy Rockwood or *Equivalent*.

## **2.12 DOOR STOPS AND HOLDERS**

- .1 Wall mounted door stops

- .1 Where a door is indicated in the *Contract Drawings* to strike flush against a wall, wall bumpers shall be provided. *Provide* convex or concave design as indicated.

- .1 Specified Manufacturers: Assa Abloy Rockwood or *Equivalent*.

- .2 Overhead stops/holders

- .1 Where specified, overhead stops/holders as shown in the hardware sets are to be provided. Track, slide, arm and jamb bracket shall be constructed of extruded bronze and shock

absorber spring shall be of heavy tempered steel. Overhead stops shall be of non-handed design.

- .1 Specified Manufacturers: Assa Abloy Rixson 1/2/9/10 Series or *Equivalent*.

## **2.13 GASKETING AND THRESHOLDS**

- .1 On exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. *Provide* seals as required to meet UL10C. *Provide* only those units where silicon seal strip is easily replaceable and readily available from stocks maintained by manufacturer. *Provide* head seal as solid aluminum extrusion suitable for stop applied hardware i.e. P/A closers or surface overhead door stops.
- .2 Door Sweeps: House nylon brush seal in extruded aluminum case. Surface applied and adjusted to suit gap at bottom of door, complete with snap cover.
- .3 Auto Door Bottoms: Surface or semi mortise automatic door bottoms housed in aluminum case and equipped with nylon brush inserts. Each unit sized to suit the door width and meets the requirements of ANSI/BHMA 156.22-2003 for latching force and air infiltration.
- .4 Astragal Seal: House nylon brush seal in extruded aluminum case. Surface applied, meeting stile astragal, consisting of two pieces attached to pull side face of door. Adjust during installation for proper seal prior to attaching snap cover.
- .5 *Provide* threshold units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames. All threshold units shall comply with the *Accessibility for Ontarians with Disabilities Act (AODA)*.

- .1 Specified Manufacturers: Assa Abloy Pemko or *Equivalent*.

## **2.14 SILENCERS**

- .1 Furnish rubber door silencers all hollow metal frames; two per pair and three per single door frame.

## **2.15 SLIDING DOOR TRACK**

- .1 Supply sliding door track and hardware for doors weighing up to 200lbs for standard applications. *Provide* needle bearing rollers and aluminum track. Where noted *Provide* sliding door hardware in kit form consisting of hangers, nylon guide, stops and adjustable wrench and mounting hardware. For applications of heavy sliding doors use individual components designed to carry required load capacities, as noted in the hardware schedule.

- .1 Specified Manufacturer: Assa Abloy Pemko or *Equivalent*.

## **2.16 ELECTRONIC PRODUCTS AND ACCESSORIES**

- .1 Keypads
  - .1 Keypads shall be 24VDC and operate a 5-amp Double Pole double Throw (DPDT) relay to switch any type of fail-safe or fail-secure electric lock or strike and be weather proof, vandal resistant and suitable for mounting on a narrow mullion. The keypad system circuit board shall be a remote unit to allow for increased security. Release time shall be programmable from 1 to 99 seconds. Keypads shall support 2-to-7-digit codes for a minimum of 59 users and shall be locked out for 30 seconds when 16 wrong digits are entered. System shall have user/installer programmable options such as anti-tailgate, anti-door prop, and duress code alarm.

- .1 Specified Manufacturer: Assa Abloy Securitron DK26 Series or *Equivalent*.
- .2 Keyswitches
  - .1 Keyswitches shall be furnished on a stainless steel single gang face plate with a 12/24VDC bi-color LED and an integral backing bracket that shall permit integration with any 1.25" or 1.125" mortise cylinder. Keyswitches shall be available for momentary or maintained action and in narrow stile designs.
    - .1 Specified Manufacturers: Assa Abloy Securitron MK Series or *Equivalent*.
- .3 In-line power controller
  - .1 Where specified, electrified *Products* shall be supplied with an in-line power controller that enables the hardware to operate from 12 to 32 volts. On board safety features shall include an in-line fuse to protect the hardware and host system from any possible reverse current surges. The controller shall regulate current to *Provide* continuous duty operation without the typical head build up.
    - .1 Specified Manufacturers: Assa Abloy HES 2005 Smart-Pac III or *Equivalent*.
- .4 Power supplies
  - .1 Power supplies shall furnish regulated 24VDC and shall be UL class 2 listed. LED's shall monitor zone status (voltage/no voltage) and slide switches shall be provided to connect or disconnect the load from power; 1, 4 or 8 separate output circuit breakers shall be provided to divide the load. Power supplies shall have the internal capability of charging optional 24VDC sealed lead acid batteries in addition to operating the DC load. Power supplies shall be supplied complete requiring only 120VAC to the fused input and shall be supplied in an enclosure. Power supplies shall be provided with emergency release terminals that allow the release of all devices upon activation of the fire alarm system.
    - .1 Specified Manufacturer: Assa Abloy Securitron BPS or *Equivalent*.
- .5 Elynx cables
  - .1 All power transfer hinges, electrified locksets, electric exit device trim and electric exit devices are to be equipped with Molex plug connectors. Door and Frame Elynx cables have been specified at a provisional length at each of these locations. The *Contractor* shall ensure that the finishing hardware *Supplier* supplies these cables, prior to door/frame manufacture, in appropriate lengths required by the various manufacturers. The Contractor shall ensure that the hardware *Supplier* contacts the door manufacturers to determine the cabling route and supply the correct length. Where the door manufacturer requires flying ends on Elynx cables the hardware installer will be responsible to map and pin Molex connectors.
    - .1 Specified Manufacturer: Assa Abloy McKinney or *Equivalent*.

## **2.17 FINISHES**

- .1 The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 or traditional U.S. finishes shown by certain manufacturers for their *Products*.
- .2 *Provide* quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.



## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine scheduled openings, with installer present, for compliance with requirements for; installation tolerances, labelled fire door assembly construction, wall and floor conditions, and other *Site* conditions affecting performance. Notify the *Consultant* in writing of any discrepancies or conflicts between the door schedule, door types, *Drawings* or scheduled hardware. Discrepancies and conflicts to be resolved in writing prior to installation of hardware.
- .2 Examine hardware to ensure it is free from defects prior to installation.
- .3 Ensure that building is secured and free from weather elements prior to installation of interior door hardware.

### **3.2 PREPARATION**

- .1 Door and Frame Preparation: Field prepare doors and frames for all function holes and fasteners under 25.4mm (1") as per the manufacturer(s) templates and installation instructions provided. Drill and tap as required.

### **3.3 INSTALLATION**

- .1 *Install* each item of mechanical and electromechanical hardware and access control equipment to comply with the manufacturer's written instructions and according to specifications. All items to be installed with fasteners identified by manufacturer's installation instructions unless otherwise noted in the *Contract Documents*.
- .2 Mounting Heights: Install door hardware at heights indicated in the following applicable publications unless; specifically indicated or required by Authorities Having Jurisdiction , requirements to match existing conditions, special templates, necessary coordination with door elevations, and or to ensure consistency with pairs of doors.
  - .1 DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames"
  - .2 DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors"
  - .3 ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities"
  - .4 NWWDA
- .3 Power door operator *Products* and accessories are required to be installed by an AAADM certified technician or equivalent certification acceptable to the *Consultant*, as approved by the manufacturer. Adjust for proper opening and closing operation after final balancing of HVAC system.
- .4 Wall stops: Locate wall stops to contact door pulls/levers at mounting post connecting to door. Ensure existence of necessary wall reinforcing where specified for installation on drywall, plaster or clad wall conditions prior to installation.
- .5 Closers: Size closers as per manufacturer's installation instructions. Adjust all closers after final balancing of HVAC system to ensure; proper latching of doors, proper closing/latch speed, adequate backcheck and opening force in accordance with referenced accessibility requirements.
- .6 Protection plates – Install on clean surface, and in temperature range of 5-25 degrees Celsius where tape applied. Pre-drill pilot holes doors when using mechanical fasteners.

- .7 Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Section 07 92 00 -Joint Sealants.
- .8 Architectural Seals – Install prior to other soffit mounted door hardware as indicated in hardware schedule. Ensure continuous seal of gasketing to door without impeding latching.
- .9 Door Bottoms – Ensure continuous seal to threshold or finished floor.
- .10 Electronic hardware systems: Install all electronic hardware as per electrical elevations and point-to-point drawings furnished under 01 33 00 Submittals & Procedures.

### **3.4 FIELD QUALITY CONTROL**

- .1 The *Contractor* shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures for coordinating all portions of work under the *Contract*, unless the *Contract Documents* give other specific instructions.
- .2 The *Contractor* shall conduct periodic inspections to ensure that door frames are installed plumb, level and square with verification by installer prior to installation of doors and door hardware.
- .3 The *Contractor* shall ensure that the hardware *Supplier* attends *Site* meetings as required to ensure proper execution of the guidelines set forth in this Section.
- .4 The *Contractor* shall ensure that the hardware *Supplier* performs a final field inspection of installed door hardware after final adjustment of all *Products* and documents and reports any deficiencies or omissions for correction and written acceptance by the *Consultant*.

### **3.5 ADJUSTING**

- .1 Adjust and verify proper operation and function of each operating item of hardware (including electromechanical) on all doors prior to acceptance and occupancy. Replace units that cannot be adjusted to operate freely and as intended for the application made, without any additional cost to the Owner.

### **3.6 CLEANING AND PROTECTION**

- .1 The *Contractor* shall protect all hardware, as it is stored on construction *Site* in a covered, dry and secure place. Protect exposed hardware installed on doors and frames during the construction phase. Install any and all hardware at the latest possible time frame.
- .2 Remove manufacturer's protective coating from items after written acceptance of installation by the *Consultant*.
- .3 Clean operating items as necessary to restore to proper function and finish of hardware and doors.
- .4 Clean adjacent surfaces soiled by door hardware installation.

### **3.7 DEMONSTRATION**

- .1 Instruct the *Owner's* maintenance personnel in the proper adjustment, operation and maintenance of mechanical and electromechanical door hardware, electronic devices and maintenance of finishes.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Administrative Requirements
- .5 1.5 Submittals
- .6 1.6 Closeout Submittals
- .7 1.7 Quality Assurance
- .8 1.8 Delivery, Storage, and Handling
- .9 2.1 Performance/Design Requirements
- .10 2.2 Automatic Door Operators - General
- .11 2.3 Automatic Door Operators - Door Frame/Wall Mounted
- .12 2.4 Finishes
- .13 2.5 Fabrication
- .14 3.1 Examination
- .15 3.2 Preparation
- .16 3.3 Installation
- .17 3.4 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Automatic door operators.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination:
  - .1 Check dimensions at the *Place of the Work* before fabrication commences, and report to the *Consultant* in writing all discrepancies.
  - .2 Where dimensions are not available before fabrication commences, the dimension required shall be agreed upon between the Contractor and the Consultant.

### **1.5 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00. – Submittal Procedures.
- .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 during construction for use by installers and fabricators as required for proper location and installation of hardware.

## 1.6 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 – Contract Closeout Procedures and Submittals.
- .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 Contract Closeout Procedures and Submittals.

## 1.7 QUALITY ASSURANCE

.1 Qualifications:

.1 Installers / applicators / erectors:

- .1 Execute the work of this Section only by a *Subcontractor* who has the 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 five years, and with 10 years' satisfactory experience.
- .2 The *Contractor* shall ensure that the installer is approved in writing by the manufacturer of the operators for installation of its *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.

## 1.8 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 Underwriters Laboratories of Canada (ULC) listed and labelled hardware in fire separations and exit doors.
- .2 The *Contractor* shall be responsible for, and abide by, all requirements and regulations of the Ontario Building Code. Conduct tests and inspections required and pay all charges incidental thereto.

## 2.2 AUTOMATIC DOOR OPERATORS - GENERAL

- .1 Operation:
  - .1 Activation type:
    - .1 Push-plate.
  - .2 Door to safely stop and reverse if an object is encountered in the opening or closing cycle.
  - .3 Manual opening force: 62 N.
  - .4 Closing force: 26.6 N.
  - .5 Factory-set door hold open voltage.
  - .6 Fail safe: In the event of power failure, door shall operate manually, without damage to operator components.
- .2 Activators; wall-mounted:
  - .1 Push-plate:
    - .1 Formed stainless steel plate, satin finish, approximately 127 mm (5") square, with depressed wheelchair logo marking, two required per opening.
  - .2 Electrical supply: 120 Volt.

## 2.3 AUTOMATIC DOOR OPERATORS - DOOR FRAME/WALL MOUNTED

- .1 *Provide* adjustment by microprocessor for the following:
  - .1 Opening speed.
  - .2 Back-check.
  - .3 Hold-open, from 5 seconds to 30 seconds.
  - .4 Closing speed.
  - .5 Opening force.
  - .6 Acceleration during opening and recycling, for soft start.
- .2 Controller:
  - .1 Completely electromechanical capable of the following functions:
    - .1 Obstruction detection.
    - .2 Initialization and power on.
    - .3 Door motion learn cycle.

- .4 Manual mode, without spring closer.
- .5 Power open/power close logic.
- .2 Control box and motor/gear box to be contained in aluminum housing finished to match aluminum entrances, precision-machined gears and bearing seats and all- weather lubricant, mounted on vibration isolators.
  - .1 Design for surface-mounted application on surface of door frame/wall, maximum 3 mm (1/8") above top of door.
  - .2 Design for interior application.
- .3 Gears: manufactured by operator manufacturer specifically for operators being provided.
- .4 Motor: Direct Current (DC) permanent magnet motor with shielded ball bearings. Stop motor when door stops or is fully open and when breakaway is operated.
- .5 Door operating arm: forged steel, attached at natural pivot point of door. Do not use side block in top of door. Exposed arms to be factory polished and finished to match operator enclosure.
- .6 Control circuits for actuators and safeties: low-voltage, National Electrical Code (NEC) Class II.
- .7 Service conditions: satisfactory operation between -34°C and 71°C.
- .3 Acceptable Products:
  - .1 Typical: Horton '7100 Series' by Hunter Automatics Inc. or *Equivalent*.

## 2.4 FINISHES

- .1 Finish components to match aluminum framed glazing systems in conjunction with which they are to be provided, in accordance with Section 08 41 00 – Aluminium Framed Glazing Systems.

## 2.5 FABRICATION

- .1 Fit intersecting members to flush hairline weathertight joints and mechanically fasten together, except where indicated otherwise in the Contract Documents.
- .2 Conceal fastenings from view, except where indicated otherwise in the Contract Documents.
- .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.

### **3.2 PREPARATION**

- .1 Before furnishing any hardware, carefully check the *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 the manufacturer's instructions and in accordance with CAN/CSA C22.2 No. 247-92(R2014).
- .2 *Provide* operator system complete in all its parts and connected to electrical service provided as part of the work of Divisions 26 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 the *Supplier's* instructions.

**END OF SECTION**

## PART 1 – GENERAL

### 1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including Sections of Division 01.

### 1.2 SECTION INCLUDES

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 References
- .5 1.5 Submittals
- .6 1.6 Closeout Submittals
- .7 1.7 Quality Assurance
- .8 1.8 Delivery, Storage, and Handling
- .9 1.9 Field Conditions
- .10 1.10 Extended Warranty
- .11 2.1 Performance/Design Requirements
- .12 2.2 Glass Materials
- .13 2.3 Fire Protection Rated Glass
- .14 2.4 Glazing Materials (non-fire rated)
- .15 2.5 Glazing Accessories (fire rated)
- .16 2.6 Fabrication
- .17 3.1 Examination
- .18 3.2 Preparation
- .19 3.3 Glazing - General
- .20 3.4 Tape Glazing
- .21 3.5 Gasket Glazing (Dry)
- .22 3.6 Sealant Glazing (Wet)
- .23 3.7 Installation – Mirrors
- .24 3.8 Field Quality Control
- .25 3.9 Protection
- .26 3.10 Finishing

### 1.3 SUMMARY

- .1 Section includes:
  - .1 Glass and glazing.

### 1.4 REFERENCES

- .1 Definitions:



- .1 Deterioration of coated glass: Defects developing from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking and other indications of deterioration in metallic coating.
- .2 Deterioration of insulating glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture or film on interior surfaces of glass.
- .3 Deterioration of laminated glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delaminating material obstructing vision through glass and blemishes exceeding those allowed by referenced laminated glass standards.
- .4 Interspace or airspace: The space between lites of any insulating glass unit that contains dehydrated air or a specified gas.
- .5 Manufacturer: A firm that produces primary glass or fabricated glass products as defined in referenced glazing publications.

## 1.5 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 in the Contract Drawings as engineered and glass to serve as guards in accordance with the Ontario Building Code, *Shop Drawings* to be engineered *Shop Drawings*.
  - .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 three control samples for each glass type showing maximum range of visible difference between units for the project.
- .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) Please review this insertion which was made to ensure compliance with trade treaties. Submittal to include thermal stress and structural load analysis of the proposed glass types, configuration and sizes.
  - .7 Submit sample glazing warranty.
  - .8 Submit letter from Insulating Glass Manufacturers Association of Canada (IGMAC) or equivalent association 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*.

## 1.6 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 = Contract Closeout Procedures and Submittals.
- .2 Operation and maintenance data:
  - .1 Submit maintenance and cleaning instructions for glass and glazing for incorporation into the operating and maintenance manuals.

## 1.7 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 10 years of fabrication experience and meet ANSI / ASQC 9002 1994.
  - .2 Installers / applicators / erectors: The *Contractor* shall *Provide* the work of this Section executed by *Subcontractor* who is thoroughly trained and experienced in skills required, be completely familiar with referenced standards and requirements of the work of this Section, and who will personally direct installation performed under this Section.
    - .1 Foreperson experience: a minimum of 10 years' experience as glazing mechanic.
    - .2 Typical glazing mechanic experience: a minimum of three years' experience as glazers.
    - .3 Mirror installations: Installation only by applicator trained and approved by adhesive manufacturer for application of its *Products*.
  - .3 Licensed professionals: Retain a *Professional Engineer* to design the work of this Section; to prepare, seal and sign *Shop Drawings*; and to perform field review. *Shop Drawings* must show both design and installation requirements.
- .2 Mock-ups:
  - .1 *Provide* mock-up of mirror installation, including minimum of four full size mirrors.
  - .2 Locate mirror mock-up where approved by the *Consultant*.

## 1.8 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.

## 1.9 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.

## 1.10 EXTENDED WARRANTY

- .1 Special product warranty for insulating glass unit *Products*:
  - .1 *Provide* a written warranty from date of manufacture for sealed insulating glass units. Warranty must 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 from the date of Substantial Performance.
- .2 Special *Product* warranty for mirror glass *Products*:
  - .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 from the date of Substantial Performance.

## 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 in the Contract Documents. Refer to these publications for glazing terms not otherwise defined in this Section.
    - .1 Glass Association of North America (GANA) Glazing Manual.

- .2 GANA Engineering Standards Manual.
- .3 GANA Laminated Glazing Reference Manual.
- .4 GANA Sealant Manual.
- .2 Regulatory requirements:
  - .1 Fire rated glass:
    - .1 Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.
  - .3 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 5 breaks per 1000 for heat soaked tempered glass as a result of verifiable Nickel Sulphide (NiS) inclusion.
        - .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.
    - .4 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, where applicable, and the Ontario Building Code.
    - .5 *Provide* annealed, heat strengthened, and tempered lights where required by the Ontario Building Code, and where required for the various solar exposures on the building.
    - .6 Glass thicknesses and glass types specified, indicated, or scheduled in the *Contract Documents* are minimums required. The *Contractor's* glass designer/engineer to modify as required to satisfy design and Ontario Building Code requirements, and requirements of the *Authorities Having Jurisdiction*, and any such modifications shall be clearly indicated on *Shop Drawings*.
- .4 Thermal and optical performance: *Provide* glass *Products* with performance properties specified or published by glass manufacturer where not specified. Performance properties to be manufacturer's published data as determined according to the following procedures:
  - .1 Centre of glass U-Value: National Fenestration Rating Council (NFRC) 100 methodology using 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.
- .5 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.
- .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 in the Contract Documents and composed of primary glass obtained from a single source and manufacturing plant for each type and class required.

### .2 Insulating glass units (IG):

- .1 Hermetically sealed, CAN/CGSB 12.8-97, minimum 12 mm (1/2") air space, air filled, double sealed edges (primary to be polyisobutylene, secondary to be polysulphide/polyurethane, desiccant filled aluminum spacer bar.
  - .1 The minimum thickness of the secondary seal shall be 1.59 mm (1/16").
  - .2 The target width of the primary seal shall be 3.97 mm (5/32").
  - .3 There shall be no voids or skips in the primary seal.
  - .4 Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1.59 mm (1/16") by maximum length of 50 mm (2") with gaps separated by at least 450 mm (18"). Continuous contact between the primary seal and the secondary seal is desired.
  - .5 Both primary and secondary sealant adhesion shall exhibit continuous, tenacious adhesion to both glass and spacer contact areas.
- .2 Warm edge, hermetically sealed, CAN/CGSB 12.8-97, minimum 12 mm (1/2") air space, 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 The minimum thickness of the secondary seal shall be 1.59 mm (1/16").
  - .2 The target width of the primary seal shall be 3.97 mm (5/32").
  - .3 There shall be no voids or skips in the primary seal.
  - .4 Gaps or skips between primary and secondary sealant are permitted to a maximum width of 1.59 mm (1/16") by maximum length of 50 mm (2") with gaps separated by at least 450 mm (18"). Continuous contact between the primary seal and the secondary seal is desired.

- .5 Both primary and secondary sealant adhesion shall exhibit continuous, tenacious adhesion to both glass and spacer contact areas.
- .6 Warm edge spacer:
  - .1 Vinyl faced, electrolytic tinplated steel: Fenzi North America 'Warmedge' or *Equivalent*.
  - .2 Spacer bar colour:
    - .3 Black.
- .3 Insulating Glass Manufacturers Association of Canada (IGMAC) or certified by equivalent association.
- .4 Low 'E' coating (double silver):
  - .1 Acceptable *Products*:
    - .1 Vitro Architectural Glass 'Solarban 90'.
    - .2 Or *Equivalent*.
- .5 Glass thickness: 6 mm (1/4") minimum, and as required to suit design requirements.
- .6 Glass colour: clear, unless otherwise indicated in the *Contract Documents*.
- .7 Performance Requirements:
  - .1 Visible Light Transmittance: 41 percent minimum
  - .2 Winter Nighttime U-Factor: 0.47 (Btu/hr\*ft<sup>2</sup>\*°F) maximum
  - .3 Summer daytime U-Factor: 0.45 (Btu/hr\*ft<sup>2</sup>\*°F) maximum
  - .4 Shading Coefficient: 0.26 maximum
  - .5 Solar Heat Gain Coefficient: 0.23 maximum
  - .6 Outdoor Visible Light Reflectance: 16 percent maximum
  - .7 U-value: 0.29
- .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 *Provide* thickness as indicated or greater thickness as needed to comply with requirements. 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 in the Contract Documents.
  - .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 Mirrors:
  - .1 Annealed glass, to ASTM C1503-08(2013) as follows:
    - .1 Grade: Mirror Cut Size.
    - .2 Quality: Mirror Select Quality, except allowable distortion shall be  $\geq 80^\circ$  vision interference angle to ASTM C1036-11e1 Table 5.
    - .3 Colour: Clear.
    - .4 Thickness: 6 mm (1/4")
    - .5 Exposed edges shall be chamfered, ground, and polished.
  - .6 Ceramic-coated spandrel glass:
    - .1 Glass treatment:
      - .1 Tempered float glass.
    - .2 Thickness: 6 mm (1/4") minimum thickness.
    - .3 Coating Location: Second surface.
    - .4 Fallout Resistance: Passes fallout-resistance test in ASTM C1048-12e1 for an assembly of glass and adhered reinforcing material.
    - .5 Ceramic enamel coating, baked on.
      - .1 Colour: Custom colour to later selection by the *Consultant*
    - .6 Acceptable ceramic coating manufacturers:
      - .1 Viracon Inc.
      - .2 Prelco Inc.
      - .3 Or *Equivalent*.

## 2.3 FIRE PROTECTION RATED GLASS (FPRG)

- .1 Fire rated, impact safety resistant glass, non-wired:
  - .1 Film-faced ceramic glazing:
    - .1 Fire-rated and impact safety-rated, clear ceramic glazing material with surface applied impact safety film, and listed for use in doors, sidelites, transoms, and borrowed lites in both interior and exterior applications, not functioning as a barrier to heat.
    - .2 Fire-ratings: as indicated or scheduled, from 20 minutes to 90 minutes, 3 hours in doors where applicable, with hose stream test.
    - .3 Impact Safety Resistance: ANSI Z97.1-2010 and CPSC 16 CFR 1201 (Cat. I and II).
    - .4 Surface finish:

- .1 Premium Grade: clear glass, polished for superior optical clarity.
- .5 Acceptable *Product*:
  - .1 Schott Gemtron (Canada) Corporation 'Pyran Platinum F'.
  - .2 Technical Glass Products Ltd. 'FireLite NT'.
  - .3 Or *Equivalent*.

## 2.4 GLAZING MATERIALS (NON-FIRE RATED)

- .1 Glazing materials; general: Select glazing sealants, tapes, gaskets and additional glazing materials of proven compatibility with other materials they will contact, including glass *Products*, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
- .2 Glazing gaskets: Moulded or extruded gaskets of profile and hardness required to maintain watertight seal, made from the following:
  - .1 Preformed, Ethylene Propylene Diene Monomer (EPDM) to ASTM C864-05(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, EPDM to ASTM C864-05(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, EPDM to ASTM C864-05(2011).
- .5 Edge blocks: Moulded or extruded material of hardness needed to limit glass lateral movement (side walking) made from the following:
  - .1 Preformed, EPDM to ASTM C864-05(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.
  - .2 Acceptable manufacturer: Norton Company or *Equivalent*.
  - .3 Acceptable *Products*: As recommended by manufacturer suitable for conditions of application and use.
- .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' or '795'.
    - .2 Pecora Corporation '864' or '890'.



- .3 Sika Canada Inc. 'Sikasil WS-290' or 'WS-295'.
- .4 Tremco Inc. 'Spectrum 2'.
- .5 Momentive Performance Materials Inc. 'SilGlaze II'.
- .6 Or *Equivalent*.
- .9 Mirror clips:
  - .1 Nickel plated, CR Laurence 'Vancouver' clips or *Equivalent*.
- .10 Mirror adhesive: Palmer Mirro-Mastic, or *Equivalent*. Complete with sealer as required.

## **2.5 GLAZING ACCESSORIES (FIRE RATED)**

- .1 Glazing tape; fire-rated glass (non-wired):
  - .1 Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapour seal.
  - .2 Silicone sealant: One-part neutral curing silicone, medium modulus sealant, to ASTM C920-11, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable.
    - .1 Acceptable Products:
      - .1 Dow Corning '795'.
      - .2 Momentive Performance Materials Inc. 'Silglaze-II 2800'.
      - .3 Tremco Inc. 'Spectrem 2'.
      - .4 Or *Equivalent*.
  - .3 Setting blocks: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.
  - .4 Cleaners, primers, and sealers: Type recommended by manufacturer of glass and gaskets.

## **2.6 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 or *Equivalent*. Sealed units shall bear IGMAC certification markings.
- .2 Grind, chamfer, and polish exposed glass edges, unless otherwise indicated in the *Contract Documents*.

## **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 in the *Contract Documents*, 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 the *Site* and legally dispose of off *Site*. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- .4 Clean glazing rebate surfaces of traces of dirt, dust, or other contaminants.
- .5 Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- .6 Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- .7 Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- .8 *Provide* spacers for glass lites where length plus width is greater than 1270 mm (50").

- .1 Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
- .2 *Provide* 3.2 mm (1/8") minimum bite of spacers on glass and use thickness equal to sealant width.
- .9 *Provide* edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel.
- .10 Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- .11 Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- .12 Glaze hollow metal doors and frames specified under work of Section 08 11 13 using tape glazing installation.
- .13 Install fire rated glazing in accordance with fire rated glazing material manufacturer's specifications. Field cutting or tampering is not permissible.

### 3.4 TAPE GLAZING

- .1 Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- .2 Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- .3 Cover vertical framing joints by applying tapes to heads and sills first and then to jambs.
- .4 Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- .5 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.
- .6 Do not remove release paper from tape until right before each glazing unit is installed.
- .7 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.
- .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  $\leq 1$  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 the *Consultant's* direction, unless otherwise indicated. *Provide* butt joints with flat ground and polished edges to *Provide* inconspicuous joint complete with black tape behind joint to hide wall substrate.
- .4 Mastic adhesive and top and bottom support clip installation:
  - .1 Secure mirrors in place over mastic adhesive with metal clips. Locate clips at not more than 914 mm (36") on centre on top and bottom edges of mirrors.
  - .2 Make sure mirror and substrate are free of dust, clean, and dry. On nonporous substrates, such as glass, tile, or metal, sealing is not necessary. On porous substrates, such as drywall or wood, use Mirro-Mastic Bond or equivalent (or a primer or sealer, not paint) on the substrates and allow it to dry. Painted surfaces should be sanded through to the original surface and the substrate cleaned and sealed where the mastic is to be applied.
  - .3 Support mirror at the bottom using concealed bottom angles.
  - .4 Apply mirror adhesive to the mirror or substrate in a minimum of 1 ping-pong ball size mound for every 0.0929 m<sup>2</sup> (1 ft<sup>2</sup>) of mirror. Do not apply mastic too close to the edge to prevent "squeeze out". Place the mounds so space will be left between them when the mirror is installed. Mastic adhesive shall be at room temperature (22°C).
  - .5 Press mirror firmly in place making good contact between the mirror, mastic, and substrate. Mastic should spread to a pat approximately 114 mm (4-1/2") in diameter. The mastic needs air circulation to cure properly. Curing time will depend on temperature, humidity, type of substrate, and amount of air that can reach the mastic.

### 3.8 FIELD QUALITY CONTROL

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.

### **3.9 PROTECTION**

- .1 *Provide* safety markings to installed glass by attaching streamers or tape to face of sash. Do not apply tape directly to the glass. Do not mark the glass with paint or any other substance that is hard to remove or could leave permanent stains.
- .2 Take all precautions necessary to protect stored glass and installed glass from lime mortar, water run-off from concrete or copper, weld spatter, acids, roofing tar, solvents, abrasive cleaners, careless handling of construction machinery and equipment, and any other activities that could permanently damage the glass.
- .3 *Install* protective cover to glass where there is a high risk of damage. Use plywood, heavy kraft paper, or non-staining transparent plastic sheet. Do not let protective materials contact surface of glass.
- .4 Do not rely on use of adhesive plastic films to protect installed glass. When plastic sheeting is used, it must be transparent, suspended away from the surface of the glass, and be provided with adequate ventilation holes to prevent heat build-up.

### **3.10 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 - Contract Closeout Procedures and Submittals.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 1.6 Extended Warranty
- .7 2.1 Manufacturer
- .8 2.2 Performance/Design Requirements
- .9 2.3 Louvres
- .10 2.4 Accessories
- .11 2.5 Finishes
- .12 2.6 Fabrication
- .13 3.1 Installation

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Louvres.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 Air Movement and Control Association (AMCA) test data as required to confirm that the louvres have the specified air and water performance characteristics when tested in accordance with AMCA Standard 500-L-99.

## 1.5 QUALITY ASSURANCE

.1 Qualifications:

- .1 Installers / applicators / erectors: *Provide* work of this Section, executed by competent installers with minimum five years' experience in application of *Products*, systems and assemblies specified, and with approval of *Product* manufacturer.

## 1.6 EXTENDED WARRANTY

- .1 Warrant work of this Section in accordance with Section 01 78 36 – Warranties for a period of two years as specified in Article A-15 of the Agreement Between *Owner* and *Contractor*.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- .1 *Specifications* are based on *Products* of the McGill Architectural Products. The following listed manufacturers are acceptable only when in compliance with requirements of this Section:
- .1 E.H. Price Ltd.
- .2 McGill Architectural Products
- .3 TenPlus Architectural Products Ltd.
- .4 Or *Equivalent*

### 2.2 PERFORMANCE/DESIGN REQUIREMENTS

- .1 Structural requirements: Design louvres to withstand wind and snow loads as required by the Ontario Building Code. 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 *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 louver 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.

## 2.3 LOUVRES

- .1 Except as noted under subsection 2.3.2 (below), *Provide* HP245 , frame depth 50 mm, flanged frame, complete with bird screen, to sizes indicated.
- .2 At Generator Room, *Provide* HP445, frame depth 100 mm, channel frame, complete with bird screen, to sizes indicated.

## 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 mitered 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.
- .8 Sealant: in accordance with Section 07 92 00 – Joint Sealants.

## 2.5 FINISHES

- .1 Exposed aluminum surfaces:
  - .1 Elsewhere: Finish to be Interpon D2000, AAMA 2604, Powder Coating, or *Equivalent*
  - .1 Colour: to be selected by the *Consultant*.
- .2 Finish exposed metal fasteners, if applicable, to related aluminum surfaces.
- .3 Finish steel clips and reinforcing steel with 380 g/m2 (13 oz/ft2) zinc coating in accordance with 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.
- .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, at the *Contractor's* expense.
- .9 Set units level, plumb and true to line, with uniform joints.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 2.1 Performance/Design Requirements - Fire Resistance Rated Assemblies
- .7 2.2 Materials - General
- .8 2.3 Partition Support Materials
- .9 2.4 Ceiling Support Materials and Systems
- .10 2.5 Furring
- .11 2.6 Accessories
- .12 3.1 Installation General
- .13 3.2 Blocking
- .14 3.3 Furring - General
- .15 3.4 Suspended and Furred Ceilings
- .16 3.5 Wall Furring
- .17 3.6 Resilient Furring
- .18 3.7 Metal Stud Partition Framing
- .19 3.8 Control Joints
- .20 3.9 Concrete Anchors
- .21 3.10 Field Quality Control

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Metal support systems for interior gypsum and cement board partitions, interior ceilings and interior assemblies.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 Test and evaluation reports:

- .1 Submit certified test results for each required fire resistance rated assembly for work of this Section.

## 1.5 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 *Provide* work of this Section, executed by a *Subcontractor* with a minimum five years' 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 in the Contract Documents or required, *Provide* materials and installations that are identical with those of applicable assemblies tested by fire testing laboratories acceptable to the *Authorities Having Jurisdiction*.
- .2 Materials for fire resistance rated construction shall conform to requirements of indicated fire resistance rated assembly.

### 2.2 MATERIALS - GENERAL

- .1 For sheet metal *Products*: Sheet metal thickness indicated herein pertains to the "minimum base steel thickness exclusive of coating".

### 2.3 PARTITION SUPPORT MATERIALS

- .1 Interior non-loadbearing channel stud framing: in accordance with ASTM C645-14; roll formed from 0.455 mm (0.0179") minimum thickness unless otherwise indicated in the Contract Documents 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 Steel studs; at backer plate locations: 0.836 mm (0.0329") minimum thickness.
  - .2 Steel studs at cement board locations: 0.836 mm (0.0329") minimum thickness.
  - .3 Steel studs at tile backer board locations: 0.836 mm (0.0329") minimum locations.
- .2 Interior floor and ceiling tracks (runners): in accordance with ASTM C645-14; 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 At carpet locations: 124 mm (4-7/8") high floor tracks, Bailey Metal Products 'Carpet Base Track' or *Equivalent*.
- .3 Runner fasteners:
  - .1 To concrete and masonry: Use stub nails or power-driven fasteners.

- .2 To suspended ceilings: Use prefinished clips to match ceiling grid, as manufactured by CGC or *Equivalent*.
- .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.

## 2.4 CEILING SUPPORT MATERIALS AND SYSTEMS

- .1 General: Size ceiling support components to comply with ASTM C754-15 unless otherwise indicated in the *Contract Documents*.
- .2 Main runners: Steel channels, hot or cold rolled; Z180 (G60) galvanized where used in shower rooms, other wet areas, and outdoors.
- .3 Hanger wire: in accordance with ASTM A641/A641M-09A (2014), soft, Class 1 galvanized, minimum 4.064 mm (0.160", 8 AWG).
- .4 Hanger rods and flats: Mild steel with zinc coating, galvanized for exterior applications.
  - .1 General: Size devices for five 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 Construction Products Canada, complete with galvanized angle clip.
    - .3 ITW Ramset Trubolt, or Dynabolt anchors by ITW Construction Products Canada, complete with galvanized angle clip.
    - .4 Hilti Corporation Kwik-Bolt 3 - HHDC 1/4 Ceiling Hangers by Hilti.
    - .5 Or *Equivalent*.
  - .5 Fasteners exposed to weather, condensation, and corrosion: Zinc-plated or stainless steel fasteners in applicable *Product* lines specified in preceding subsections.
- .5 Tie wire: 1.19 mm (0.047", 18 AWG) minimum zinc coated, soft-annealed wire, in accordance with ASTM A641/A641M-09A (2014).
- .6 Furring anchorages: 1.62 mm (0.0637", 16 AWG) galvanized wire ties, manufacturer's standard wire type clips, bolts, nails or screws as recommended by furring manufacturer and complying with ASTM C754-15.
- .7 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, in accordance with 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.

## 2.5 FURRING

- .1 Furring channels: 0.455 mm (0.0179") minimum typical thickness, minimum 0.836 mm (0.0329") at exterior soffits, cold rolled steel, wiped coated, nominal size of 22 mm (7/8") depth x 35 mm (1-3/8") face, hat type with knurled face.
- .2 Resilient furring channels: 'Resilient Channel' as manufactured by Nicholson Roll forming or Bailey Metal or *Equivalent*.
- .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.

## 2.6 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 Plywood backer plates: Softwood plywood; 19 mm (3/4") minimum x length and width to suit size of items to be attached; fastened to studs for attachment of surface mounted fittings and accessories.
  - .3 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 in this Section. Do not bridge building expansion joints with support system. Frame both sides of joints with furring and other supports as indicated in the Contract Documents.
- .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 the Drawing locations.
  - .3 Do not exceed 1.5 mm (1/16") variation between planes of abutting edges or ends.
  - .4 *Install* each framing member so fastening surfaces vary not more than 3.2 mm (1/8") from the plane formed by faces of adjacent framing.
  - .5 In double stud walls, do not bridge across studs on opposite sides of wall with gypsum board or metal cross bracing.

- .3 Give complete cooperation and direction to trades erecting framing and furring over which this work is applied. Coordinate finished joint location with framing.
- .4 Coordinate installation and cooperate with mechanical and electrical work to accommodate mechanical electrical items and any other work required to be incorporated into or coordinated with the partitions, ceiling, and soffit systems.
  - .1 Where the presence of suspended ductwork or other mechanical or electrical services or devices above ceiling framing conflicts with ceiling framing suspension points from structure above, *Provide* bridging framing below conflicting work as required to support ceiling framing on specified intervals.
  - .2 Do not suspend ceiling framing from mechanical or electrical suspension systems unless agreement is obtained in writing from *Professional Engineer* for the *Subcontractor* installing such framing that additional imposed loads are acceptable; The *Contractor* shall obtain the *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 or furring members or as indicated in the Contract Documents.
- .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 Coat hooks.
  - .2 Washroom accessories.
  - .3 Mop brackets/shelving.
  - .4 Handrail anchors.
  - .5 Guards.
  - .6 Fitments.
  - .7 Cabinetry.
  - .8 Shelving.
  - .9 Window shades.
  - .10 Finish hardware.
  - .11 Toilet partition wall attachment points.
  - .12 Urinal screen wall attachment points.

- .13 Miscellaneous specialties.
- .14 Glazing accessories.
- .15 Benches.
- .16 Items as indicated in the Contract Documents.

### 3.3 FURRING - GENERAL

- .1 Furring indicated in the *Contract Documents* is schematic. Do not regard as exact or complete. *Provide* all necessary framing and furring to support gypsum board in accordance with manufacturers' specifications.
- .2 Shim furring as required to achieve required installation tolerances.
- .3 Leave finished work rigid, secure, square, level, plumb, curved to detailed radius and erected to maintain finish gypsum board line dimensions and contours. Make allowance for thermal movement.
- .4 Thermally separate metal studs from exterior concrete or masonry.

### 3.4 SUSPENDED AND FURRED CEILINGS

- .1 Arrange hangers for suspended gypsum board ceilings to *Provide* support independent of walls, columns, pipes, ducts; erect plumb, and securely anchored to structural frame, or embed in concrete slabs.
- .2 Keep lateral braces at hangers back 450 mm (18") minimum unless otherwise noted in the *Contract Documents*.
- .3 Space hangers at 914 mm (36") on centre maximum along runner channels, and not more than 150 mm (6") from ends.
- .4 Space runner channels at 1220 mm (48") on centre, maximum, and not more than 150 mm (6") from boundary walls, interruptions of continuity, and changes in direction. Run channels transversely to structural framing members.
- .5 Where splices are necessary, lap members at least 200 mm (8") and wire each end with 2 loops. Avoid clustering or lining up of splices.
- .6 Attach to rod hangers by bending hanger sharply under bottom flange of runner, and securely wiring in place with saddle tie.
- .7 Erect cross furring channels transversely across runner channels at 400 mm (16") on centre maximum, 305 mm (12") on centre at fire rated assemblies, at not more than 150 mm (6") from boundary wall openings, interruptions in ceiling continuity, and changes in direction.
- .8 Secure furring channels to each support with purpose-made slips or wire tie. Splice joints by lapping channels and tying together.
- .9 Level cross furring channels to maximum tolerance of 3 mm in 3 m (1/8" in 10 ft).

### 3.5 WALL FURRING

- .1 *Install* steel furring for braced walls, free standing walls, walls that are furred out as indicated in the *Contract Documents*.

- .2 Frame openings and around built-in equipment, cabinets, access panels, on four 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 in the *Contract Documents*.
- .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 in the Contract Documents, place interior studs vertically at centres as follows:
  - .1 *Provide* studs at 400 mm (16") on centre, and as specially spaced in accordance with details indicated.
  - .2 *Provide* studs not more than 50 mm (2") from abutting walls, openings, and each side of corners.
  - .3 *Provide* freedom for 19 mm (3/4") deflection under beams, structural slabs and the like to avoid transmission of structural loads to studs or *Install* 50 mm (2") leg ceiling tracks.
- .3 *Install* studs in tracks at floor and ceiling.
- .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 two 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.

### **3.8 CONTROL JOINTS**

- .1 Control joints: in accordance with Section 09 29 00 – Gypsum and Cement Board.

### **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.

### **3.10 FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 1.6 Delivery, Storage, and Handling
- .7 1.7 Field Conditions
- .8 2.1 Performance/Design Requirements
- .9 2.2 General
- .10 2.3 Gypsum Board Panels
- .11 2.4 Cement Board Panels
- .12 2.5 Attachment Materials
- .13 2.6 Accessories
- .14 2.7 Related Support Assemblies and Backer Plates
- .15 2.8 Joint Treatment Materials
- .16 2.9 Acoustic Wall Assembly Materials
- .17 2.10 Access Doors
- .18 3.1 Installation
- .19 3.2 Accessories
- .20 3.3 Board Application - General
- .21 3.4 Water Resistant Gypsum Board Application
- .22 3.5 Exterior Sheathing Board Application – Gypsum Sheathing Board
- .23 3.6 Interior Tile Backer Board Application
- .24 3.7 Interior Cement Board
- .25 3.8 Acoustic Wall Assemblies
- .26 3.9 Finishing
- .27 3.10 Fire Separations
- .28 3.11 Access Doors
- .29 3.12 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section includes
  - .1 Gypsum board; plain.

- .2 Gypsum board; fire-rated.
- .3 Water resistant backing board; paper faced gypsum.
- .4 Tile backer board; cement board.
- .5 Exterior sheathing board; glass scrim gypsum sheathing board.
- .6 Gypsum board accessories and miscellaneous related materials.

#### 1.4 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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.

#### 1.5 QUALITY ASSURANCE

- .1 The *Contractor* shall ensure that the *Subcontractor* executing the work of this Section has a minimum of 10 years' continuous experience in successful installation of work of type and quality indicated and specified.

#### 1.6 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.
- .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.

#### 1.7 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 subcontractors 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 the *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:
  - .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, in accordance with ASTM C1396/C1396M-11.
  - .2 Acceptable *Products*:
    - .1 CertainTeed 'Regular Gypsum Board'.
    - .2 CGC Inc. 'SHEETROCK Gypsum Panel, Regular'.
    - .3 Georgia-Pacific 'ToughRock Gypsum Board'.
    - .4 Lafarge 'Gypboard'.
    - .5 National Gypsum 'Gold Bond Gypsum Board'.
    - .6 Or *Equivalent*.
- .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, in accordance with ASTM C1396/C1396M-11.
  - .2 Acceptable *Products*:
    - .1 CertainTeed 'Type X and Type C'.
    - .2 CGC Inc. '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'.

- .6 Or *Equivalent*.
- .3 Water resistant gypsum backing board (greenboard), wall applications:
  - .1 Paper faced gypsum core panel with enhanced water and water resistant paper facers in accordance with ASTM C1396/C1396M-11, fire rated where indicated in the Contract Documents.
  - .2 Acceptable *Products*:
    - .1 CertainTeed 'ProRoc Moisture Resistant'.
    - .2 CGC Inc. 'SHEETROCK Mold Tough Panel'.
    - .3 Georgia-Pacific 'ToughRock Moisture-Guard'.
    - .4 Lafarge 'Mold Defense'.
    - .5 Or *Equivalent*.
  - .4 Exterior sheathing board:
    - .1 Service grade: Exterior grade.
    - .2 Fibreglass mat faced on front and back sides and long edges, silicone-treated water-resistant core, in accordance with ASTM C1177/C1177M-08, fire rated where indicated in the Contract Documents.
      - .1 Acceptable *Products*:
        - .1 CertainTeed 'GlasRoc Sheathing'.
        - .2 CGC Inc. 'Securock Glass-Mat Sheathing'.
        - .3 Georgia-Pacific 'Dens-Glass Gold'.
        - .4 Lafarge; Weather Defense Platinum Sheathing'.
        - .5 Or *Equivalent*.

## 2.4 CEMENT BOARD PANELS

- .1 Cement board; interior and exterior grade, tile backer board and sheathing 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 Thickness: 12.7 mm (1/2") minimum.
  - .3 Acceptable *Products*:
    - .1 CGC 'Durock'.
    - .2 National Gypsum 'PermaBase Plus Cement Board'.
    - .3 Or *Equivalent*.

## 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 in accordance with 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.
- .2 Screws; for cement board: Wafer head, Type S-12 point or 'Hi-Lo', self-tapping, with corrosion resistant polymer finish.
- .3 Tie wire: 1.6 mm (0.063") diameter galvanized soft annealed steel wire.

## 2.6 ACCESSORIES

- .1 Accessories: in accordance with ASTM C1047-14a unless otherwise indicated in the Contract Documents, 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 Trim reveal:
  - .1 Standard metal trim reveal for suspended gypsum board walls or ceilings abutting concrete block walls, suitable for paint finish in all locations except where indicated otherwise in the *Contract Documents*.
- .3 Control joints: No. 093 Zinc Control Joint by CGC Inc. or *Equivalent*, certified by manufacturer for use at fire resistance rated assemblies.
- .4 Casing beads, corner beads: 0.5 mm (0.02") base thickness commercial grade sheet steel with Z275 zinc finish in accordance with ASTM A525, perforated flanges, one piece length per location.

## 2.7 RELATED SUPPORT ASSEMBLIES AND BACKER PLATES

- .1 Dimensional wood blocking at interior assemblies: in accordance with Section 06 10 53 – Rough Carpentry.
- .2 Metal support systems and backer plates at interior assemblies: in accordance with Section 09 22 00 – Metal Supports for Gypsum and Cement Board.

## 2.8 JOINT TREATMENT MATERIALS

- .1 General: Comply with ASTM C475/C475M-12e1.
- .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.
  - .2 Water-resistant gypsum backing board: Use setting-type taping compound and setting-type, sandable topping compound.

## 2.9 ACOUSTIC WALL ASSEMBLY MATERIALS

- .1 Acoustic sealant; concealed locations: non-skinning butyl sealant, non-hardening, remains soft and tacky, in accordance with 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'.
    - .5 Or *Equivalent* (substitutions in accordance with Section 01 25 00 – Product Substitution Procedures).
- .2 Acoustic sealant; exposed locations: Interior paintable sealant in accordance with Section 07 92 00 - Joint Sealants.
- .3 Acoustic compound: premixed perlite plaster.
- .4 Acoustic (sound attenuation) insulation:
  - .1 Mineral-fibre sound attenuation batts: in accordance with CAN/ULC S702-09, Type 1, fire resistant and non-combustible in accordance with CAN/ULC-S114-05, high density for sag-free, tight fitting installation.
    - .1 Density: minimum 40 kg/m<sup>3</sup> (2.5 lbs/ft<sup>3</sup>).
    - .2 Acceptable *Products*:
      - .1 Roxul Inc. 'AFB'.
      - .2 Or *Equivalent*.
  - .2 Fasteners: use mechanical fasteners where required to secure insulation into position in accordance with insulation manufacturer.

## 2.10 ACCESS DOORS

- .1 Access doors: in accordance with Divisions 21, 22, and 23 and Divisions 26 and 28.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- .1 General: Comply with ASTM C840-11, GA-216, GA-600, and manufacturer's instructions, except as otherwise indicated in the Contract Documents. Do not bridge building expansion joints with support system. Frame both sides of joints with furring and other supports as indicated in the Contract Documents.
- .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 in the Contract Documents, 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 The work shall include bulkheads over doors, frames, screens, and changes in ceiling levels, pipe space and as indicated in the Contract Documents.
- .12 *Provide* clearances between work of this Section and structural elements to prevent transference of structural loads in accordance with Section 09 22 00 – Metal Supports for Gypsum and Cement Boards.
- .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.
- .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 in the Contract Documents.
- .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 in the Contract Documents.
- .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 other subcontractors 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 in the *Contract Documents*.
- .3 Apply board with long dimension perpendicular to supports, unless otherwise indicated in the *Contract Documents*.
- .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 in the Contract Documents.
  - .3 At typical board ceilings at 305 mm (12") on centre at edges and field unless otherwise required in the Contract Documents.
- .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.

### 3.4 WATER RESISTANT GYPSUM BOARD APPLICATION

- .1 Apply water resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

### 3.5 EXTERIOR SHEATHING BOARD APPLICATION – GYPSUM SHEATHING BOARD

- .1 *Install* sheathing in accordance with manufacturer's instructions and applicable instructions in GA-253, 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 in the *Contract Documents*.
- .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").

### 3.6 INTERIOR TILE BACKER BOARD APPLICATION

- .1 *Install* in accordance with manufacturer's specifications.
- .2 Section 09 31 00 – Tiling 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 in the Contract Documents and in accordance with manufacturer's installation instructions. Install water barrier sheeting over gypsum board substrates, where applicable.
- .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 tub or shower base as applicable.

### **3.7 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.

### **3.8 ACOUSTIC WALL ASSEMBLIES**

- .1 Sound attenuation insulation:
  - .1 *Install* sound attenuation insulation to fill cavity unless otherwise indicated in the *Contract Documents*.
  - .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 in the *Contract Documents*.
  - .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.

### **3.9 FINISHING**

- .1 *Provide* levels of gypsum board finish for locations as follows, in accordance with GA- 214.

- .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 the in the *Contract Documents*.
- .4 Level 5: Exposed gypsum board surfaces where indicated in the *Contract Documents*.
- .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 two separate coats of joint compound.
  - .5 Third coat (Level 4):
    - .1 After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 50 mm (2") beyond edge of second coat.

- .2 Allow third coat to dry. Apply additional compound, and touch-up and sand, to *Provide* surface free of visual defects, tool marks, and ridges, and ready for application of finish.
- .3 Finished joints will be accepted with a camber not greater than 1 mm (1/32") and shall be seamless, plumb, true and flush and with square, neat corners.
- .4 Fastener heads and accessories shall be covered with total of three 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 Water-resistant gypsum board: Treat fastener heads and joints with setting-type joint compound.
  - .1 For joints to be covered with tile, apply tape and joint compound bedding coat and skim coat only; do not apply finish coats.
  - .2 Do not crown joints or leave excess compound on panels.
  - .3 Remove tool marks and ridges.
  - .4 For fastener heads to be covered with tile, apply one coat of joint compound.
- .4 Interior tile backer board: Prepare and finish joints in accordance with manufacturer's instructions.
- .5 Cement board: Prepare, tape, and finish joints in accordance with manufacturer's instructions.
- .6 Joint compound:
  - .1 Apply finish coat of compound feathering 75 to 100 mm (3" to 4") beyond tape edges.
  - .2 Feather coats onto adjoining surfaces so that camber is maximum 0.79 mm (1/32").
- .7 Trim:
  - .1 Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by the trim manufacturer.
  - .2 *Install* metal corner beads at external corners.
  - .3 *Install* metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi exposed, and where gypsum base terminates against dissimilar material.
  - .4 Erect beads plumb or level, with minimum joints.
- .8 Control joints:
  - .1 *Provide* control joints set in board facing. Support control joints with studs or furring channels on both sides of joint.
  - .2 *Provide* control joints in required locations.
    - .1 Review control joint locations with the *Consultant* prior to installation.
  - .3 *Install* control joints where a partition, wall, or ceiling traverses a construction joint (expansion, seismic or building control element) in the building structure.

- .4 *Install* control joints where a wall or partition runs in an uninterrupted straight plane exceeding 9100 mm (30 linear feet).
- .5 *Install* control joints in interior ceilings:
  - .1 With perimeter relief:
    - .1 Linear dimensions between control joints shall not exceed 15000 mm (50 ft) and total area between control joints shall not exceed 230 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 the *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.

### **3.10 FIRE SEPARATIONS**

- .1 *Install* fire-rated assemblies in accordance with assembly listing requirements in order to obtain fire ratings indicated and as required by the *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 in the *Contract Documents*.
- .3 Use fire rated gypsum wallboard as specified in the *Contract Documents*.
- .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 in the *Contract Documents*.

### **3.11 ACCESS DOORS**

- .1 Install access doors to mechanical and electrical fixtures specified in respective Sections of Divisions 21, 22, and 23 and Divisions 26, and 28.

- .2 Access doors shall be as supplied by Divisions 21, 22, and 23 and Divisions 26, and 28. Locations to be reviewed and confirmed by the *Consultant*.
- .3 Install access panels in locations to be determined by coordination with trades installing mechanical, electrical and other building services and consultation with the *Consultant*.
- .4 Rigidly secure frames to furring or framing systems.

### **3.12 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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Administrative Requirements
- .5 1.5 Submittals
- .6 1.6 Closeout Submittals
- .7 1.7 Quality Assurance
- .8 1.8 Field Conditions
- .9 1.9 Extended Warranty
- .10 2.1 Performance/Design Requirements
- .11 2.2 Tile Materials
- .12 2.3 Grout and Adhesives
- .13 2.4 Accessories
- .14 3.1 Examination
- .15 3.2 Preparation
- .16 3.3 Mixing
- .17 3.4 Installation - General
- .18 3.5 Setting
- .19 3.6 Waterproofing Membrane Installation
- .20 3.7 Crack Suppression Membrane (Crack Isolation Membrane) Installation
- .21 3.8 Mortar-Bed Tiling
- .22 3.9 Thin-Set Method
- .23 3.10 Control Joints
- .24 3.11 Grouting or Pointing
- .25 3.12 Installation Tolerances
- .26 3.13 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section includes
  - .1 Hard surface tiling.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Sequencing and Scheduling
  - .1 Coordinate installation of tile work with related work.



- .2 Proceed with tile work only after curbs, vents, drains, piping, and other projections through substrate have been installed and when substrate construction and framing of openings have been completed.

## 1.5 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 Samples:
  - .1 Submit full size samples of each type of tile specified.

## 1.6 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .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 type and colour of tile required for the *Work* for maintenance use.
  - .2 Maintenance material to be of same production run as installed material.

## 1.7 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 during a period of at least the immediate past five years.
    - .2 The *Contractor* shall ensure that the *Subcontractor* is a member company in good standing of the Terrazzo, Tile and Marble Association of Canada or equivalent certification acceptable to the *Consultant* and have been a member for at least the past five years.

## 1.8 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.
- .3 For concrete floor substrates subject to moisture sensitive materials, conduct the following tests in accordance with the following:
  - .1 Test for moisture vapour transmission in accordance with ASTM F710-11 and ASTM F1869-11 or ASTM F2170-11 in accordance with manufacturer's written installation instructions. Results must not exceed the written recommendations of the *Product* manufacturer.
  - .2 Test for surface Potential of Hydrogen (pH). Levels of pH shall not exceed the written recommendations of the *Product* manufacturer. Test in accordance with ASTM F710-11.
  - .3 For each test type: Conduct three tests for flooring applications up to 93 m<sup>2</sup> (1000 square feet) in area, and one additional test for each additional 93 m<sup>2</sup> (1000 square feet) of flooring area.

## **1.9 EXTENDED WARRANTY**

- .1 Warrant work of this Section for a period of two years in accordance with Article A-15 of the Agreement Between *Owner* and *Contractor*.

## **PART 2 – PRODUCTS**

### **2.1 PERFORMANCE/DESIGN REQUIREMENTS**

- .1 Terrazzo, Tile and Marble Association of Canada ("TTMAC") Specification Guide 09 30 00 Tile Installation Manual 2012-2014.

### **2.2 TILE MATERIALS**

- .1 Tile company, size and color as noted on the *Drawings*.

### **2.3 GROUT AND ADHESIVES**

- .1 Acceptable manufacturers:
  - .1 Ardex Canada.
  - .2 Flextile Ltd.
  - .3 LATICRETE International, Inc.
  - .4 MAPEI Corp.
  - .5 TEC Specialty Products, Inc.
  - .6 Or *Equivalent*.
- .2 Setting adhesives; interior applications:
  - .1 Portland cement/sand/latex mixture, in accordance with ANSI A108/A118/A136.1-2013 and with minimum Shear Bond (Porcelain Tile, immersion and dry 28 *Day* cure tests) of 2.3 MPa (340 psi) when tested to ANSI A108/A118/A136.1-2013.
    - .1 Acceptable *Products*:
      - .1 Ardex 'X 77 Microtec Fibre Reinforced'.
      - .2 Flextile '51' mixed with Flextile '44'.

- .3 Laticrete 'Laticrete 4237 Latex Thin Set Liquid' with 'Portland 211 Crete Filler Powder'.
  - .4 Mapei 'KERALASTIC' mixed with 'KERABOND'.
  - .5 TEC Specialty Products, Inc. 'Super Flex Latex-Modified Thin Set Mortar'.
  - .6 Or *Equivalent*.
- .2 Metal substrate conditions: Epoxy mortar setting mix in accordance with ANSI A108/A118/A136.1- 2013.
  - .1 Ardex Canada 'S 16 Rapid Setting Thin Set'.
  - .2 Flextile Ltd. '100 Flex-Epoxy'.
  - .3 Laticrete International Inc. 'Latapoxy 210 Modified Epoxy Adhesive'.
  - .4 Mapei Corp. 'Kerapoxy 9931'.
  - .5 Or *Equivalent*.
- .3 Grout:
  - .1 TEC Specialty Products, Inc. '100% Solids Epoxy Mortar and Grout 470' or *Equivalent*.
    - .1 Sanded, polymer-modified, latex-modified, non-shrink, ANSI A108/A118/A136.1- 2013 and ANSI A108/A118/A136.1-2013.
      - .1 Ardex Canada 'FL Rapid Set, Flexible Sanded'.
      - .2 Flextile Ltd. '600'.
      - .3 Laticrete International Inc. '1500 Series' mixed with '1776 Grout Admix'.
      - .4 Mapei Corp. 'Keracolour S'.
      - .5 TEC Specialty Products, Inc. 'AccuColour Premium Sanded'.
      - .6 Or *Equivalent*.
    - .2 Unsanded, polymer-modified, latex-modified, non-shrink, ANSI A108/A118/A136.1-2013 and ANSI A108/A118/A136.1-2013.
      - .1 Ardex Canada 'FG-C Microtec (unsanded)'.
      - .2 Flextile Ltd. '500'.
      - .3 Laticrete International Inc. '1600 Series' mixed with '1776 Grout Admix'.
      - .4 Mapei Corp. 'Keracolour U'.
      - .5 TEC Specialty Products, Inc. 'AccuColour Premium Unsanded'.
      - .6 Or *Equivalent*.
  - .3 Epoxy, to ANSI A108/A118/A136.1-2013.
    - .1 Ardex Canada 'WA Epoxy Grout and Adhesive'.
    - .2 Flextile Ltd. '100 Flex-Epoxy 100% Solids Epoxy Grout'.

- .3 Laticrete International Inc. 'SpectraLOCK™ PRO Grout'.
- .4 Mapei Corp. 'Kerapoxy' and Kerapoxy CQ'.
- .5 TEC Specialty Products, Inc. '100% Solids Epoxy Mortar and Grout'.
- .6 Or *Equivalent*.
- .4 Scratch coat (by volume): 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail. Premixed mortar may be used in accordance with manufacturer's instructions. Adjust water volume depending on moisture content of sand to obtain consistency and workability.
- .5 Slurry bond coat: mix Portland cement and water to a creamy paste consistency. Include latex additive where required by TTMAC Detail.
- .6 Mortar bed for walls (by volume): 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail. Premixed mortar may be used in accordance with manufacturer's instructions. Adjust water volume depending on moisture content of sand to obtain consistency and workability.
- .7 Leveling coat (by volume): 1 part Portland cement, 4 parts sand, and latex additive where required by TTMAC Detail. Premixed mortar may be used in accordance with manufacturer's instructions.
- .8 Mortar bed for floors; where applicable: 1 part cement, 4 parts sand, 1 part water. Water volume may be adjusted depending on water content of sand.

## 2.4 ACCESSORIES

- .1 Waterproofing membrane: in accordance with Section 07 13 26 – Sheet Waterproofing.
- .2 Cleavage membrane: 0.11 mm (0.004") thick polyethylene film, to CAN/CGSB 51.34 - M86 (amended 1988).
- .3 Reinforcing wire fabric: galvanized welded wire fabric, 50 mm (2") x 50 mm (2"), WO.3 x WO.3 (16 ASW gauge or 1.6 mm (0.0625") diameter, in accordance with ASTM A1064/A1064M-15 and ASTM A1064/A1064M-15, except for minimum wire size.
- .4 Sealant: in accordance with CAN/CGSB 25.20-95 and tile and grout manufacturers' recommendations, colour selected by the *Consultant*.
- .5 Shower Thresholds: white carrera, 19 mm (3/4") thick, beveled edges two sides, honed finish on exposed surfaces, size to suit opening and frame width.
- .6 Edge Protection and Transition Profiles for Floors
  - .1 At Same Height Transitions:
    - .1 Schluter-SCHIENE: L-shaped profile with 1/8 inch (3 mm) wide visible surface integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
      - .1 Anchoring Leg: Straight anchoring leg.
      - .2 Anchoring Leg: Radius anchoring leg for radius applications.
      - .3 Profile Height: As required to coordinate with tile selection and setting system.
      - .4 Material and Finish:

- .1 AE: Satin Anodized Aluminum.
- .5 Or equivalent.
- .2 At Sloped Transitions:
  - .1 Schluter-RENO-RAMP-K: Anodized aluminum profile with textured, sloped exposed surface, tapered leading edge, and integrated grout joint spacer.
    - .1 Material and Finish: AE: Satin Anodized Aluminum.
    - .2 Profile Height: 1/2 inch (13 mm).
    - .3 Ramp Length: 2-1/2 inch (64 mm).
    - .4 Or equivalent.
- .7 Finishing and Edge-Protection Profiles for Walls
  - .1 At Tile Edges (unless noted otherwise):
    - .1 Schluter-JOLLY: L-shaped profile. 9/64 inch (3.5 mm) wide top and vertical wall sections that together form the visible surface. Integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
      - .1 Anchoring Leg: Straight anchoring leg.
      - .2 Profile Height: As required to coordinate with tile selection and setting system.
      - .3 Material and Finish:
        - .1 AE: Satin Anodized Aluminum.
        - .4 Or equivalent.
    - .2 At Corners (unless noted otherwise):
      - .1 Schluter-RONDEC: bullnose trim profile (10mm x 2.5mm), integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
        - .1 Profile Height: As required to coordinate with tile selection and setting system.
        - .2 Material and Finish:
          - .1 AE: Satin Anodized Aluminum.
          - .3 Or equivalent.
  - .8 Finishing and Edge-Protection Profiles for Tile Bases
    - .1 At Top of Base Edge (unless noted otherwise):
      - .1 Schluter-JOLLY: L-shaped profile. 9/64 inch (3.5 mm) wide top sections that together form a continuous visible surface. Integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
        - .1 Anchoring Leg: Straight anchoring leg.
        - .2 Profile Height: As required to coordinate with tile selection and setting system.
        - .3 Material and Finish:

- .1 AE: Satin Anodized Aluminum.
- .4 Or equivalent.
- .2 At Outside Corners of Bases (unless noted otherwise):
  - .1 Schluter-RONDEC: bullnose trim profile (10mm x 2.5mm), integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer. Terminate at top edge of base to horizontal L-shaped profile specified above. File L-shaped profile to match radius of outside corner profile (typical unless noted otherwise).
    - .1 Profile Height: As required to coordinate with tile selection and setting system.
    - .2 Material and Finish:
      - .1 AE: Satin Anodized Aluminum.
      - .3 Or equivalent.
- .9 Prefabricated movement joints: purpose made, having a Shore A Hardness of not less than 60 and elasticity of  $\pm 40\%$  when used in accordance with TTMAC Detail 301EJ- 2002.
- .10 Floor sealer and protective coating: to tile and grout manufacturers' recommendations.
- .11 Water vapour reduction system:
  - .1 100% solids epoxy one coat system, 0 Volatile Organic compound (VOC), suitable for application to 100% Relative Humidity (RH) floors per ASTM F2170-11, 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 Ensure 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%.

## **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 *Consultant*. Do not proceed with the tile work until surfaces and conditions comply with the requirements indicated in the manufacturer's instructions and in ANSI A108/A118/A136.1-2013) specification.
- .3 Miscalibrated tiles, tiles with chipped corners, tiles with holes, shall not be accepted by the *Contractor* for installation.
- .4 Carefully inspect the 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 Water vapour reduction system:
  - .1 Where concrete substrate exhibits higher than permitted moisture and alkalinity levels, *Provide* water vapour reduction system to protect moisture sensitive flooring system from elevated moisture and alkalinity levels.
    - .1 Shot blast floors to an International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) #3 or #4 and clean surfaces with an industrial vacuum cleaner and remove residues from the substrate. Grinding is allowed only in areas not accessible by shot blasting. Remove defective materials, and foreign matter such as dust, adhesives, levelling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, and other deleterious substances. Repair cracks, expansion joints, control joints, and open surface honeycombs and fill in accordance with water vapour reduction system manufacturer's recommendations.
    - .2 Reinforcing fibres, if applicable, that are visible after shot blasting shall be removed and vacuumed leaving no fibres left on the concrete surfaces.
    - .3 Repair concrete prior to moisture vapour reduction system installation by using water vapour reduction system manufacturer's recommended bonding emulsion with approved concrete repair materials. Comply with requirements as listed in water vapour reduction system manufacturer's technical data information. Consult with vapour reduction manufacturer.
    - .4 Shot blast a small test area and review surface profile with the finished flooring applicator. As the water vapour reduction system is not a levelling material, *Provide* feather finish or levelling material to "flatten" or level the water vapour reduction system treated concrete prior to the flooring installation.
    - .5 Apply moisture vapour reduction system monolithically to manufacturer's recommended spreading rate in number of coats to achieve manufacturer's recommended thickness.
    - .6 Consult with vapour reduction manufacturer and comply with requirements as listed in water vapour reduction system manufacturer's technical data information.
    - .7 Review surface profile with the finished flooring applicator. As the water vapour reduction system is not a levelling material, *Provide* feather finish or levelling material to "flatten" or level the water vapour reduction system treated concrete prior to the flooring installation. Flooring installation shall not show telegraphing of substrate. Flooring installation shall be homogenous free of substrate lines, pockets, bumps and unevenness.

- .8 Verify proper adhesion of flooring adhesives, coatings, and levelling compounds to the final vapour reduction coating system for acceptability.
- .9 Do not proceed with finished flooring installation if moisture vapour transmission exceeds maximum permitted rates.
- .2 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 Floor surfaces:
  - .1 Completely remove contaminants and deleterious substances and debris which may prevent, reduce, and affect adhesion or performance or may act as bond breaker.
  - .2 Concrete shall be minimum of 120 Days old.
- .4 Wire brush steel substrates to remove deleterious substances and rust, to promote full adhesion to steel.

### 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 INSTALLATION - GENERAL

- .1 *Install Products* in accordance with manufacturer's specifications and as indicated in this Section.
- .2 *Install* in accordance with TTMAC Specification Guide 09 30 00 Tile Installation Manual 2012-2014, except where specified otherwise in the Contract Documents.
- .3 *Install* in accordance with ANSI A108/A118/A136.1-2013 and ANSI A108/A118/A136.1- 2013.
- .4 Lay out tile work as indicated on the *Drawings*, and where lay-out not indicated, lay-out tiles so tiles less than 1/2 the least dimension do not occur and with minimum amount of cutting.
- .5 Make joints even, straight, plumb and of uniform width.
- .6 *Provide* uniform positive slope to floor drains, to minimum allowable slope of 20 mm/m (1/4 inch/ft).



- .7 *Provide* edge protection at tile edges and corners, unless otherwise indicated in the Contract Documents, using maximum length pieces.
- .8 *Provide* edge protection and transition strips at tile transitions, unless otherwise indicated in the Contract Documents, using maximum length pieces.
- .9 Lap tile at inside corners and seal around doors. Apply sealant in accordance with Section 07 92 00 – Joint Sealants and manufacturer's instructions. Sealant colour to later selection by the *Consultant*.
- .10 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.
- .11 Review locations of tile accessories with the *Consultant* prior to setting tile and comply with directions of the *Consultant*.

### 3.5 SETTING

- .1 Using a damp towel, wipe off the back side of floor tile to remove any dust or other residue that may be left over from the manufacturing process.
- .2 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.
- .3 Prime materials and by methods specified by manufacturer of bond coat.
- .4 Line up joints between tile installed on stairs from tread to tread.
- .5 Except where tiles have setting tabs, and except for expansion, control and isolation joints, maintain joint widths as selected by the *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.
- .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 installed with chemical resistant mortars and grouts.
  - .3 Tile having tiles 300 mm (12") or larger in any direction.
  - .4 Tile having tiles with raised or textured backs.
  - .5 Tile having tile installation rated for Heavy or Extra Heavy Duty.
  - .6 Porcelain tiles with more than 20% of the tile backs covered with firing release dust back buttered so that 100% of the back is covered with adhesive mortar rated for C627, Extra Heavy Duty rating.

- .10 Remove any excess setting material from the joint area so that 2/3 of the depth of the tile is available for grouting.
- .11 Remove smudges or smears of setting material from the tile surface with a damp sponge or cloth immediately after final adjustment and beat-in while the mortar is fresh.
- .12 Do necessary cutting and drilling of fixtures, fittings, and built-in or penetrating units without marring the tile. Replace 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 one 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 At floor drains in mortar bed: *Provide* minimum setting bed of 10 mm (3/8"), sloped to drain at 6 mm (1/4") in 305 mm (12").

### **3.6 WATERPROOFING MEMBRANE INSTALLATION**

- .1 *Install* waterproofing membrane in shower areas in accordance with manufacturer's instructions and Section 07 13 26 – Sheet Waterproofing.

### **3.7 CRACK SUPPRESSION MEMBRANE (CRACK ISOLATION MEMBRANE) INSTALLATION**

- .1 *Install* membrane in accordance with manufacturer's instructions.
- .2 Prepare substrate in accordance with manufacturer's instructions.
- .3 *Install* crack suppression membrane to substrates for tile flooring installations located on suspended structural floor assemblies. Treat substrate with full coverage of crack isolation membrane and reinforcement in accordance with crack isolation membrane manufacturer's installation instructions.

### **3.8 MORTAR-BED TILING**

- .1 Verify 25 mm (1") nominal bed thickness has been allowed. 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 in compliance with current revision of ANSI A108/A118/A136.1-2013 (A-1 through A-3; A-4.1a.5.2).
- .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/adhesive from finished surfaces.

- .6 For installation of tile over cured (pre-floated) latex-Portland cement thick bed mortar, follow Thin Bed Method.

### 3.9 THIN-SET METHOD

- .1 *Install* thin-set mortar in compliance with current revisions of ANSI A108/A118/A136.1- 2013) (A-1 through A-3) and ANSI A108/A118/A136.1-2013) (A-4.3).
- .2 Use the appropriate trowel notch size to ensure full bedding of the tile.
- .3 Work thin-set mortar into good contact with the substrate and comb with notched side of trowel.
- .4 Beat each piece/sheet into the thin-set mortar with a beating block or rubber mallet to insure full bedding and flatness.
- .5 Allow installation to set until firm.
- .6 Clean excess thin-set mortar from tile face and joints between pieces.
- .7 Do not cover, bridge or fill tile joints located over expansion joints with adhesive.

### 3.10 CONTROL 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, also incorporate control joints over all building expansion joints.
- .3 Cut tiles or stones on both sides along the edges of control or expansion joints.
- .4 *Provide* control joints equal to width of interior tile 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 – Joint Sealants. In areas subject to sunlight or exposed to exterior *Provide* control joints within 2400 mm to 3500 mm (8 ft to 12 ft) centre to centre.
- .1 Review locations with the *Consultant* prior to setting tile and comply with instruction given by the *Consultant*.

### 3.11 GROUTING OR POINTING

- .1 *Install* grout to comply with ANSI A108/A118/A136.1-2013 and ANSI A108/A118/A136.1- 2013) unless otherwise specified in the Contract Documents 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 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.
- .9 Chemical resistant, water cleanable tile-grouting epoxy (ANSI A108/A118/A136.1-2013):
  - .1 *Install* chemical epoxy resistant grout in compliance with current revisions of ANSI A108/A118/A136.1-2013 and 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 1.5 mm (1/16") unless otherwise indicated in the *Contract Documents*.
- .11 Grout joint width to be 3.2 mm (1/8") unless otherwise indicated in the *Contract Documents*.
- .12 Use caution when using sanded grouts to prevent scratching of tile or other material surfaces.
- .13 Do not cover bridge or fill any expansion joints in tile with grout.
- .14 Do not cover bridge or fill any expansion joints in tile with grout.

### 3.12 INSTALLATION TOLERANCES

- .1 Maximum allowable lippage:
  - .1 Tile up to 152 mm x 152 mm (6" x 6") in size: 0.79 mm (1/32").
  - .2 Tile greater than 152 mm x 152 mm (6" x 6") in size: 1.5 mm (1/16").
- .2 Finish planes shall be straight and plumb to within 6 mm in 3 m (1/4" in 10 feet).

### 3.13 ADJUSTING AND CLEANING

- .1 Clean installed tile surfaces after grouting has cured.
- .2 Re-point joints after cleaning to eliminate imperfections. Avoid scratching tile surfaces.
- .3 Prohibit traffic during installation and for minimum 48 hours after installation.
- .4 Protect floors from impact and vibration for a minimum of 48 hours after installation.

- .5 *Install* floor protection in areas where other work, repairs and installation of equipment, and foot traffic will occur.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Administrative Requirements
- .5 1.5 Submittals
- .6 1.6 Closeout submittals:
- .7 1.7 Quality Assurance
- .8 1.8 Delivery, Storage, and Handling
- .9 1.9 Field Conditions
- .10 2.1 Performance/Design Requirements
- .11 2.2 General
- .12 2.3 Acoustical Tiles
- .13 2.4 Metal Suspension Systems
- .14 2.5 Miscellaneous Materials
- .15 2.6 Metal Finish
- .16 3.1 Installation - General
- .17 3.2 Installation - Suspension System
- .18 3.3 Installation - Tiles
- .19 3.4 Installation - Tolerances
- .20 3.5 Field Quality Control
- .21 3.6 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section includes
  - .1 Acoustical tile ceiling systems.

### **1.4 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, Heating Ventilation and Air Conditioning (HVAC) equipment, partition system, fire suppression system components and other work required to be incorporated in or coordinated with the ceiling system.

## 1.5 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 manufacturer's standard details.
  - .2 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.
  - .3 Submit reflected ceiling plans for special grid patterns as indicated on the Contract Drawings.
- .4 Samples:
  - .1 Submit sample of each component of ceiling system. Samples shall fully represent materials to be supplied in colour, texture, finish and construction.
  - .2 Submit samples, load test data and design tables for each type of insert to be used in the work for hanger supports.
- .5 Certificates:
  - .1 Submit certificate of compliance stating that the suspension system provided, including materials and installation, comply with the requirements of the *Contract Documents*.

## 1.6 CLOSEOUT SUBMITTALS:

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .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 the *Owner*.

## 1.7 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 *Provide* work of this Section, executed by competent installers with a minimum of five years' experience in application of *Products*, systems and assemblies specified in the Contract drawings and with approval and training of *Product* manufacturers.
- .2 Mock-ups:

- .1 Construct in locations acceptable to the *Consultant* a typical sample ceiling installation 10 m<sup>2</sup> in area, complete with perimeter wall trim, and cut tegular tile demonstrating rectified edge. Modify sample as required to obtain Consultant's 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 by the *Consultant*. Accepted sample may become a part of the final *Work*, subject of approval of the *Consultant*.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Ship exposed members and mouldings in rigid crates to avoid damage. Bent or deformed material shall be rejected. Baked enamelled members shall be suitably wrapped and protected against damage.
- .2 Deliver acoustical ceiling units to the *Place of the Work* in original, unopened packages and store in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- .3 Before installing acoustical ceiling units, permit them to reach room temperature and stabilized moisture content.
- .4 Handle acoustical ceiling units carefully to avoid chipping edges or damaging units.

## 1.9 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 ACT-1; Lay-in acoustical tiles:
  - .1 Classification: Type III, Form 2, Pattern C E in accordance with ASTM E1264- 08e1.



- .2 Size: to suit metal suspension system.
- .3 Noise Reduction Coefficient (NRC): 0.50.
- .4 Material: wet formed mineral fibre.
- .5 Surface texture: Fine.
- .6 Edge: Square.
- .7 Colour: White.
- .8 Flame Spread: Class A Flame Spread 25 or under, in accordance with CAN/ULC S102.
- .9 Acceptable *Products*: Armstrong World Industries 'Dune Square Lay-in 1773' or *Equivalent*.

## 2.4 METAL SUSPENSION SYSTEMS

- .1 Hanger anchorage devices: Screws, clips, bolts, concrete inserts or other devices applicable to the indicated method of structural anchorage for ceiling hangers and whose suitability for use intended has been proven through standard construction practices or by certified test data. Size devices for 3 times calculated load supported except size direct pull-out concrete inserts for 5 times calculated loads.
- .2 Concrete hanger anchors; post installed: Steel eye bolts and nuts to suit ceiling hangers with capability to sustain, without failure, a load equal to 4 times that imposed by ceiling construction, as determined by testing per ASTM E488/E488M-15, conducted by a qualified independent testing laboratory.
  - .1 ITW Ramset Dynabolt Sleeve Anchor 'TW-1614' or Readi-Tie-Drive 'TD4-112' tie wire anchor by ITW Construction Products Canada or *Equivalent*.
  - .2 Kwik-Bolt II 'HCKB 1/4' tie wire anchor by Hilti Corporation or *Equivalent*.
  - .3 Fasteners exposed to weather, condensation, and corrosion: Zinc-plated or stainless steel fasteners in applicable *Product* lines specified in preceding subsections.
- .3 Hangers and tie wire: Galvanized wire, recommended by manufacturer of suspension system, minimum 2.66 mm (0.1") (12 gauge).
- .4 Suspension system accessories:
  - .1 Splices, clips, and perimeter moulding, of manufacturer's standard type to suit the applicable conditions unless special conditions and access area are shown or specified in the *Contract Documents*.
  - .2 Angle wall mouldings; hemmed with prefinished exposed flanges:
    - .1 For 24 mm (15/16") grid applications; angle moulding with exposed bottom flange of 22 mm (7/8").
      - .1 Armstrong World Industries '7803' or equivalent.
      - .2 CGC Inc. 'M7' or *Equivalent*.
- .5 Standard suspension system, non fire-rated:
  - .1 Intermediate duty in accordance with ASTM C635/C635M-13a, 24 mm (15/16") interlocking tee system, designed to support acoustical panels in patterns indicated with deflection of

main tees less than L/360, consisting of main tees and cross tees. The system shall *Provide* lock joint intersections of cross and main tees.

.2 Acceptable *Products*:

- .1 Armstrong World Industries 'Prelude XL 15/16" Exposed Tee Systems'.
- .2 CGC Inc. 'DX'.
- .3 Or *Equivalent*.

## 2.5 MISCELLANEOUS MATERIALS

- .1 Acoustical sealant: Non-drying, non-hardening, non-skinning, non-staining, non-bleeding, gunnable sealant complying with requirements specified in Section 07 92 00 – Joint Sealants.

## 2.6 METAL FINISH

- .1 Metal exposed in finished work shall have a pre-coated baked enamel finish in non-yellowing colour. Submit paint formulation of grid system to lighting fixture, speaker grille, sprinkler and diffuser manufacturers to ensure consistency of colour, sheen and texture of all exposed metal components in the ceiling assemblies. Colour shall be:
  - .1 Flat white.

## PART 3 - EXECUTION

### 3.1 INSTALLATION - GENERAL

- .1 *Install* ceiling panels and metal suspension system in accordance with manufacturer's directions. Where manufacturer's directions are at variance with the *Contract Documents*, notify the *Consultant* before proceeding with installation.
- .2 Do not commence installation until all work above suspended ceiling has been completed, inspected and accepted.

### 3.2 INSTALLATION - SUSPENSION SYSTEM

- .1 *Install* suspension system rigid, secure, square, level and plumb, framed and erected to maintain dimensions and contours indicated, and in accordance with ASTM C636 / C636M - 13, CISCA installation standards and any other applicable national or local Building code requirements. Make allowance for thermal and structural movement.
- .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 on the Contract drawings. 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.
- .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.
  - .1 Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing mouldings.
  - .2 Screw attach mouldings to substrates at intervals not more than 400 mm (16") on centre and not more than 210 mm (8") from ends, levelling with suspension system. Lap corners accurately and connect securely.

### 3.3 INSTALLATION - TILES

- .1 Take precautions during installation to ensure tile edges are not chipped or otherwise damaged.
- .2 Minimize field cutting. Rectify cut tile edges of tile to match factory cut edge profile and colour.
- .3 *Install* acoustical tiles to form horizontal and level ceiling with all parts flush and joints butted tightly to hairline appearance.
- .4 Distribute variations in colour and texture of panels to obtain a uniform appearance.

### 3.4 INSTALLATION - TOLERANCES

- .1 Allowable tolerances: in accordance with ASTM C636 / C636M - 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 FIELD QUALITY CONTROL

- .1 Conduct quality control in accordance with Section 01 45 00 – Quality Control.

### 3.6 ADJUSTING AND CLEANING

- .1 Replace uneven, defective, or damaged materials and finishes, eliminate waves, and remove soiled or stained areas, at the *Contractor's* expense.
- .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 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 SUBMITTALS
- 1.5 CLOSEOUT SUBMITTALS
- 1.6 QUALITY ASSURANCE
- 1.7 FIELD CONDITIONS
- 1.8 EXTENDED WARRANTY

#### **PART 2 – PRODUCTS**

- 2.1 MANUFACTURERS
- 2.2 MATERIALS

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

- 3.1 EXAMINATION
- 3.2 PREPARATION
- 3.3 INSTALLATION OF RESILIENT BASE
- 3.4 INSTALLATION TOLERANCES
- 3.5 ADJUSTING AND CLEANING

### **1.3 SUMMARY**

- .1 Section Includes
  - .1 Resilient base.

### **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 Samples:
  - .1 Submit 3 - 305 mm (12") long samples of each colour and type of base material. Include outside corner of base.

### **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.

.3 Maintenance materials:

- .1 Deliver 2% of each colour, pattern and type of resilient accessory required for this project.
- .2 Suitably package for protection and storage, each identified with name of manufacturer and with its type, colour. Note date.
- .3 Tag and store where directed by *Owner*.
- .4 Maintenance materials to be same production run as installed materials.

## 1.6 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.

- .2 Products installed as part of the work of this section shall be from same production run.

## 1.7 FIELD CONDITIONS

- .1 Temperature of room and materials shall be at least 18°C and 21°C for 48 hours before, during and 7 days after the installation of resilient accessories.
- .2 Applications exposed to intense or direct sunlight, protect Products during the conditioning, installation, and adhesive curing periods, by covering the light source.
- .3 Allow coiled wall base to lay flat for at least 24 hours at 18°C prior to installation, and maintain this temperature during installation.

## 1.8 EXTENDED WARRANTY

- .1 Warrant work of this section in accordance with Section 01 78 36 for a period of 2 years.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- .1 Forbo.
- .2 Johnsonite.
- .3 Roppe.
- .4 Substitutions: in accordance with Section 01 25 00.

### 2.2 MATERIALS

- .1 Resilient base types:

- .1 Rubber base: Rubber Wall Base, as manufactured by Johnsonite, 3.2 mm (1/8") thick, 100 mm (4") high, angled profile, complete with preformed inside and outside corners with 100 mm (4") returns.
  - .1 Colour: to later selection by *Consultant* from manufacturer's full range.
- .2 Rubber base (for carpet): TightLock Carpet Wall Base, as manufactured by Johnsonite, 114.3 mm (4-1/2") high with a 108 mm (4-1/4") face surface, in a 6.3 mm (1/4") tapered wedge thickness, complete with preformed corners.
  - .1 Colour: to later selection by *Consultant* from manufacturer's full range.
- .2 Resilient leveller strip and level strip extension system: LS Series, as manufactured by Johnsonite, sized to suit condition.
- .3 Block wall filler: Latex filler, "Planicrete AC" by Mapei Canada Ltd., "43 Thin-Set Mortar Additive and 53 Floor Mix" by Flextile Ltd. or waterproof filler recommended by flooring manufacturer.
- .4 Adhesive: Types as recommended by manufacturer to suit substrate types and compatible with materials.
  - .1 Porous wall surfaces: Johnsonite #960 Wall Base adhesive
  - .2 Non-porous wall surfaces (i.e.: metal, epoxy paint, ceramics): Johnsonite #945 Contact Bond adhesive.
- .5 Sealant: clear silicone, as manufactured by Tremco, Momenitive, or Dow Corning.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Substrate shall be solid, dry, clean, smooth, free of deleterious materials and free of voids, gaps, cracks, ridges, or other defects which will preclude adequate adhesion, or will ghost or telegraph through finished base installation.
- .2 Examine walls to ensure that surfaces are protected against entry of water and moisture.

### **3.2 PREPARATION**

- .1 Clean and remove deleterious materials which will preclude adequate adhesion.
- .2 Fill gaps, voids, and cracks, and remove ridges, or other defects which will ghost or telegraph through finished base installation.
- .3 Perform compatibility test with primer/adhesive and substrate.

### **3.3 INSTALLATION OF RESILIENT BASE**

- .1 Spread adhesive to ribbed surface (back) of wall base with a 3 mm (1/8") square- notched trowel; allow slight set-up, then bring base into contact with substrate. Ensure full adhesion of base to substrate. Adhesive should cover 80% of back surface. Leave a 6 mm (1/4") uncovered space at the top of the wall base to prevent the adhesive from oozing onto the wall above the base when installed.
- .2 Position wall base on wall surface and roll with hand roller. Always roll back to starting point to prevent stretching the wall base.
- .3 Set base to ensure installation over finished flooring material is free of gaps.

- .4 Install base in longest lengths possible, minimum 2440 mm (8'). Adhere toe of base to substrate, and ensure edge of toe is straight.
- .5 Scribe and fit to door frames and other obstructions.
- .6 Joints shall be tightly fitted, straight and vertical, and not less than 610 mm (24") from corners.
- .7 *Provide* joints in base over substrate control joints.
- .8 Install factory preformed inside corners.
- .9 Install factory preformed outside corners.

### **3.4 INSTALLATION TOLERANCES**

- .1 Install straight and level 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.
- .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 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 PART 1 – GENERAL
- .2 1.1 General Instructions
- .3 1.2 Section Includes
- .4 1.3 Summary
- .5 1.4 Submittals
- .6 1.5 Closeout Submittals
- .7 1.6 Quality Assurance
- .8 1.7 Field Conditions
- .9 1.8 Extended Warranty
- .10 PART 2 - PRODUCTS
- .11 2.1 Materials
- .12 PART 3 - EXECUTION
- .13 3.1 Examination
- .14 3.2 Preparation
- .15 3.3 Installation of Tile Flooring
- .16 3.4 Field Quality Control
- .17 3.5 Adjusting and Cleaning
- .18 3.6 Protection

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Rubber tile flooring.

### **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 Samples:
  - .1 Submit samples of each pattern and colour of rubber tile flooring proposed for use in the *Work*.

### **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.

.3 Maintenance materials:

- .1 Deliver 2% of each colour, pattern and type of flooring material required for this project for maintenance use. Store where directed. Clearly identify each box.
- .2 Maintenance materials to be same production run as installed materials.

## 1.6 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 and training of *Product* manufacturers.

.2 Mock-up:

- .1 Prior to commencing flooring installation for this section, prepare full room mock- up (room size at least 10 m<sup>2</sup> (100 ft<sup>2</sup>) in area) for acceptance by the *Consultant*.
- .2 Do not proceed flooring specified in this section until mock-up has been accepted by *Contractor* and *Consultant*.

## 1.7 FIELD CONDITIONS

- .1 Install materials of this section only when surfaces and air temperatures have been maintained between 18°C and 24°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 Ensure that adequate ventilation is provided during installation and curing of materials of this section.
- .3 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.
- .4 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 F1869-11 or ASTM F2170-11 in accordance with manufacturer's written flooring installation instructions. Results must not exceed 170 µg/m<sup>2</sup> (3 lb per 1,000 ft<sup>2</sup>) in 24 hours when tested to ASTM F1869-11 or exceed 75% when tested to ASTM F2170-11.
  - .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 m<sup>2</sup> (1000 ft<sup>2</sup>) in area, and 1 additional test for each additional 93 m<sup>2</sup> (1000 ft<sup>2</sup>) of flooring area.
  - .4 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.

- .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.

## **1.8 EXTENDED WARRANTY**

- .1 Warrant work of this section in accordance with Section 01 78 36 for a period of 2 years.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Rubber tile flooring:
  - .1 Resilient rubber tile flooring composed of 100% recycled elastomers, 9.5 mm thick x 686 mm 686 mm.
  - .2 Acceptable material: Spartus 913 Charcoal, as manufactured by Tuflex.
- .2 Adhesive: Low VOC type as recommended by flooring manufacturer.
- .3 Sealant: Low VOC type, clear silicone, as manufactured by Tremco, Momentive, or Dow Corning.
- .4 Water vapour reduction system:
  - .1 100% solids epoxy one coat system, 0 VOC, suitable for application to 100% RH floors per ASTM F2170-11, 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%.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine substrate to ensure clean lines, correct level and freedom from cracks, ridges, dusting, scaling and carbonation.
- .2 Examine walls in advance of application of base to ensure that surfaces are protected against entry of water and moisture. Perform compatibility test with primer/adhesive and substrate.
- .3 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

- .4 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.

### 3.2 PREPARATION

- .1 Comply with recommendations of ASTM F710-11.
- .2 Water vapour reduction system:
  - .1 Where concrete substrate exhibits higher than permitted moisture and alkalinity levels, *provide* water vapour reduction system to protect moisture sensitive flooring system from elevated moisture and alkalinity levels.
  - .1 Shot blast floors to a International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) #3 or #4 and clean surfaces with an industrial vacuum cleaner and remove residues from the substrate. Grinding is allowed only in areas not accessible by shot blasting. Remove defective materials, and foreign matter such as dust, adhesives, levelling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, and other deleterious substances. Repair cracks, expansion joints, control joints, and open surface honeycombs and fill in accordance with water vapour reduction system manufacturer's recommendations.
  - .2 Reinforcing fibres, if applicable, that are visible after shot blasting shall be removed and vacuumed leaving no fibres left on the concrete surfaces.
  - .3 Repair concrete prior to moisture vapour reduction system installation by using water vapour reduction system manufacturer's recommended bonding emulsion with approved concrete repair materials. Comply with requirements as listed in water vapour reduction system manufacturer's technical data information. Consult with vapour reduction manufacturer.
  - .4 Shot blast a small test area and review surface profile with the finished flooring applicator. As the water vapour reduction system is not a levelling material, *Provide* feather finish or levelling material to "flatten" or level the water vapour reduction system treated concrete prior to the flooring installation.
  - .5 Apply moisture vapour reduction system monolithically to manufacturer's recommended spreading rate in number of coats to achieve manufacturer's recommended thickness.
  - .6 Consult with vapour reduction manufacturer and comply with requirements as listed in water vapour reduction system manufacturer's technical data information.
  - .7 Review surface profile with the finished flooring applicator. As the water vapour reduction system is not a levelling material, *provide* feather finish or levelling material to "flatten" or level the water vapour reduction system treated concrete prior to the flooring installation. Flooring installation shall not show telegraphing of substrate. Flooring installation shall be homogenous free of substrate lines, pockets, bumps, and unevenness.
  - .8 Verify proper adhesion of flooring adhesives, coatings, and levelling compounds to the final vapour reduction coating system for acceptability.
  - .9 Do not proceed with finished flooring installation if moisture vapour transmission exceeds maximum permitted rates.

- .3 Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- .4 Alkalinity and adhesion testing: Perform tests and proceed with installation only after substrates pass testing. Document tests performed and submit in writing to *Consultant*.
- .5 Fill cracks, holes, and depressions in substrates with trowel-applied levelling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- .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 be *Provide* smooth and seamless transition at maximum slope of 3:1000 (height to distance) ratio.
- .7 Do not install floor coverings until they are same temperature as space where they are to be installed.
  - .1 Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- .8 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.
- .9 Remove chalking and dusting from concrete surfaces with wire brushes.
- .10 Where flooring adjoins thicker floor materials, apply epoxy levelling screed, feather out to make up difference in level between materials.

### 3.3 INSTALLATION OF TILE FLOORING

- .1 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .2 Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, and the like. Extend flooring into toe spaces, door recesses, closets, and similar openings.
- .3 Maintain continuity of colour and pattern.
- .4 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
- .5 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.
- .6 Roll tile with a 45.36 kilogram (100-pound) 3-section roller prior to adhesive hardening. Refer to specific rolling instructions of the tile manufacturer. Telegraphing of adhesive marks not permitted. Perform second rolling 2 to 3 hours after first rolling.
- .7 Cut tile and fit neatly around fixed or excessively heavy objects.
- .8 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.

### **3.4 FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

### **3.5 ADJUSTING AND CLEANING**

- .1 Remove excess adhesive from surfaces of the sheet flooring and base as work progresses.
- .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 (pH of 7 - 8) and water, thoroughly buff dry with smooth wool pad. Do not apply any other compounds.
- .3 Thoroughly clean surfaces in accordance with manufacturer's recommendations.

### **3.6 PROTECTION**

- .1 Protect new floors from time of final set of adhesives until final inspection. Install suitable protection sheeting, lap joints of material by 150 mm (6") and seal with non-asphaltic tape.
- .2 Prohibit traffic on floor for 48 hours after installation. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
- .3 Install floor protection in areas where other work, repairs and installation of equipment, and foot traffic will occur.
- .4 Protect exposed edges of flooring, where finished and unfinished areas adjoining, by means of a transition strip butting to and flush with the finished surface of the flooring covering material and securely adhered to the substrate material.
- .5 Install transition strips where flooring terminates. Set flush with adjacent floor finishes.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Requests for substitutions for *Products* specified or indicated will not be considered unless the request is in strict accordance with Section 01630 Product Substitution Procedures.

### **1.2 RELATED SECTIONS**

- .1 01731 Selective Building Demolition

### **1.3 QUALIFICATIONS**

- .1 Epoxy flooring and cove base shall be applied only by the product manufacturer or by an applicator approved in writing by the manufacturer. Examples of previous similar installations and references to be submitted upon request for the *Consultant's* review prior to commencement of the work of this section.

### **1.4 SUBMITTALS**

- .1 Product data:
  - .1 Submit product data in accordance with Section 01330 Submittals.
  - .2 Submit manufacturer's technical data, installation instructions, and general recommendations for each epoxy flooring material required.
- .2 Samples:
  - .1 Submit samples in accordance with Section 01330 Submittals.
  - .2 Submit for approval, 300 mm x 300 mm square sample of each type of epoxy flooring and base required. Sample to represent, for verification purposes, the actual installation, and to show the thickness, colour, and texture of the installation. The finished work must match the approved sample.
  - .3 Sample may not remain as part of the *Work*.

### **1.5 QUALITY ASSURANCE**

- .1 Obtain primary epoxy flooring materials, including primers, resins, hardening agents, and finish or sealing coats from a single manufacturer with not less than ten (10) years of successful documented experience in the manufacture and installation of the principal materials described in this section. *Contractor* must have completed at least five (5) projects of similar size and complexity.
- .2 *Provide* secondary materials only of type and from source recommended by manufacturer of primary materials.
- .3 Epoxy flooring manufacturer's representative must be at the *Place of the Work* at the start of installation. Issues to be reviewed include, but are not limited to, the following:
  - .1 concrete condition;
  - .2 propane levels and usage;
  - .3 humidity levels;

- .4 temperature; and,
- .5 environmental conditions.

## 1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to the *Place of the Work* and examine material for completeness and shipping damage prior to commencing the work of this section.
- .2 All materials must be factory pre-weighted and pre-packaged in single, easy-to-manage batches to eliminate mixing errors at the *Place of the Work*. No weighing or volumetric measurements will be allowed at the *Place of the Work*.
- .3 Store materials undamaged in original containers with manufacturer's labels intact in a dry, enclosed area, protected from exposure to moisture.
- .4 Temperature of storage area shall be maintained between 16 deg.C and 32 deg.C.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Existing Concrete substrate must be properly prepared to receive new epoxy finish. If concrete is not acceptable to flooring manufacturer, advise *Consultant* in writing immediately.
- .2 Maintain an ambient temperature of not less than 18 deg.C, and a floor temperature of not less than 16 deg.C for seven (7) days before installation, and for at least 48 hours after completion of installation.
- .3 Maintain a relative humidity not higher than 40% for seven (7) days before installation, and for at least 48 hours after completion of installation.
- .4 If environmental conditions are not acceptable to flooring manufacturer, advise *Consultant* in writing immediately.
- .5 Ensure substrate is within moisture limits prescribed by the epoxy flooring manufacturer.
- .6 Area due to receive epoxy flooring installation to be free of other trades during, and for a period of 24 hours after, epoxy flooring installation.

## 1.8 WARRANTY

- .1 The epoxy flooring *Subcontractor* shall, and hereby does, warrant, and the *Contractor* shall and does guarantee, that the epoxy flooring and base installed under the *Work* of this *Contract* will be free from defects in both materials and workmanship, other than reasonably normal wear and tear, for a period of one (1) year.
- .2 Furnish said warranty and guarantee in writing in a form acceptable to the *Owner* and counter-signed by the *Contractor* and the epoxy flooring *Subcontractor*.
- .3 The warranty/guarantee period shall commence on the date of *Substantial Performance of the Work*.

## PART 2 - PRODUCTS

### 2.1 SEAMLESS EPOXY FLOORING

- .4 Epoxy flooring shall be 100% solids, 0 VOC, nominal 6 mm thick system, consisting of a two-component epoxy primer, a high performance, three-component trowelled mortar consisting of epoxy resin, curing agent, and selected, graded aggregates blended with inorganic pigments and a two-component, 100% solids, general service epoxy coating.

- .1 Acceptable materials:
  - .1 Stonclad GS with Stonkoat GS4, as manufactured by Stonhard Ltd.
  - .2 Cipadome S with Cipador E-150, as manufactured by CPD Construction Products.
  - .3 Duochem 9400, as manufactured by Duochem Inc.
- .5 Colours: to be selected from the manufacturer's standard range.
- .6 Finish: 'orange peel' finish achieving a slip resistance DCOF value of 0.42 or greater..
- .7 Sawcut joint filler and primers as recommended by epoxy flooring manufacturer.
- .8 Grout for sloping floors as recommended by epoxy flooring manufacturer.

### **PART3 - EXECUTION**

#### **3.1 PREPARATION**

- .9 Prepare concrete substrate by mechanical means using a shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance.

#### **3.2 APPLICATION**

- .10 Apply each compound of epoxy flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawcuts, or other types of joints indicated or required.
- .11 Primer: mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of trowelled mortar to ensure optimum adhesion between epoxy flooring materials and substrate.
- .12 Trowelled mortar: mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using stainless steel finishing trowels.
- .13 Coating: remove any surface imperfections by lightly abrading and vacuuming the floor surface. Mix coating according to manufacturer's recommended procedures. Squeegee apply and backroll coating with strict adherence to manufacturer's installation procedures and coverage rates.
- .14 Terminate floors that do not abut against vertical wall surface with a 13 mm to 19 mm wide x 6 mm deep chase.
- .15 Joint sealant: install manufacturer's epoxy or urethane sealant compatible with floor finish.

#### **3.3 FIELD QUALITY CONTROL**

- .16 The *Owner* may engage the services of an independent testing laboratory to sample materials being used in the *Work*. Samples of material will be taken, identified, sealed, and certified in the presence of the *Contractor*.
- .17 The testing laboratory will perform test for any of the characteristics specified, using applicable testing procedures referenced in the manufacturer's product data.



- .18 If the test results show the materials being used do not comply with the specified requirements, the *Contractor* may be directed by the *Owner* to: stop work; remove the non-complying materials; pay for the testing; and, to reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials. These measures will not be considered or approved as changes in the *Work*.

### **3.4 CURING, PROTECTION AND CLEANING**

- .19 Cure epoxy flooring materials in compliance with the manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of the curing process. Close area of application for a minimum of 24 hours.
- .20 Protect epoxy flooring materials from damage and wear during construction. Where temporary covering is required for this purpose, comply with the manufacturer's recommendations for protective materials and method of application.
- .21 Protect all surfaces after final coats in accordance with manufacturer's instructions.
- .22 Cleaning: remove temporary covering and clean epoxy flooring just prior to final inspection. Use cleaning materials and procedures recommended by the epoxy flooring manufacturer.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 SUBMITTALS
- 1.5 CLOSEOUT SUBMITTALS
- 1.6 QUALITY ASSURANCE
- 1.7 DELIVERY, STORAGE, AND HANDLING
- 1.8 FIELD CONDITIONS
- 1.9 WARRANTY

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

- 2.1 CARPET TILE
- 2.2 ADHESIVES
- 2.3 MISCELLANEOUS MATERIALS
- 3.1 EXAMINATION
- 3.2 PREPARATION
- 3.3 INSTALLATION
- 3.4 INSTALLATION - TRANSITION TRIM
- 3.5 SERVICE MARKING
- 3.6 FIELD QUALITY CONTROL
- 3.7 ADJUSTING AND CLEANING

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Carpet tile.

### **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 Submit layout drawings of tile pattern including recognition of possible wear locations, ease of replacement and the location and type of accessories and other information and details pertaining to the installation of carpet tile.
- .4 Samples:
  - .1 Submit 3 full size samples of each type and colour of carpet and 150 mm (6") length of transition trim for acceptance of colour and construction by *Consultant*. Obtain acceptance from *Consultant* prior to ordering material.
- .5 Test and evaluation reports:
  - .1 Submit moisture, alkalinity, and adhesive bond test results.
- .6 Manufacturers' instructions:
  - .1 Submit carpet and adhesive manufacturer's written installation recommendations for each type of substrate required.
  - .2 Identify trowel notch size and shape and required adhesive coverage rates for each specified carpet material for installation of specified materials.

## 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.
- .3 Maintenance materials:
  - .1 Deliver 2% of each carpet colour and type specified.
  - .2 Suitably package for protection and storage, each identified with name of manufacturer and with its type, colour, dye lot and yardage. Note date.
  - .3 Tag and store where directed by *Owner*.
  - .4 Maintenance materials to be same production run as installed materials.

## 1.6 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.
- .2 Mock-up:
  - .1 Prior to commencing flooring installation for this section, prepare full room mock- up (room size at least 10 m2 (100 ft2) in area) for acceptance by the *Consultant*.
  - .2 Mock-up shall include each type of carpet tile application, edge treatment and relationships to adjoining surfaces.

- .3 Location of installation shall be determined by *Consultant*.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- .1 Comply with CRI Carpet Installation Standard – 2011.

## **1.8 FIELD CONDITIONS**

- .1 Do not begin carpet tile installation until painting and finishing work are complete and ceilings and overhead work have been tested, approved, and completed.
- .2 Ensure that adequate ventilation is provided during installation and curing of materials of this section.
- .3 Ambient temperature and humidity: Comply with CRI Carpet Installation Standard – 2011.
- .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 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 F1869-11 or ASTM F2170-11 in accordance with manufacturer's written flooring installation instructions. Results shall not exceed 170 µg/m<sup>2</sup> (3 pounds per 1,000 square feet) in 24 hours when tested to ASTM F1869-11 or exceed 75% when tested to ASTM F2170-11.
- .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 m<sup>2</sup> (1000 square feet) in area, and 1 additional test for each additional 93 m<sup>2</sup> (1000 square feet) of flooring area.
- .1 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.
- .6 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.

## **1.9 WARRANTY**

- .1 General: Warrant work of this section in accordance with Section 01 78 36.
- .2 Manufacturer's warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement materials for defects attributable to materials within specified warranty period
- .1 Warranty period: 10 years.
- .3 Installer's warranty: Installer agrees to *Provide* materials and labour warranty in which installer agrees to repair or replace carpet areas that fail within the specified warranty period. Failures shall include delaminating of flooring from substrates.
- .1 Warranty period: 2 years.

## **PART 2 - PRODUCTS**

### **2.1 CARPET TILE**

- .1 Products installed as part of the work of this section shall be from same production run.

- .2 Carpet for each carpet type to be from single manufacturer.
- .3 Acceptable manufacturers:
  - .1 Interface.
  - .2 Alternates to *Consultant's* approval. Alternates shall be submitted prior to *Bid* Closing. Submit alternates in accordance with Section 01 25 00.
  - .3 CPT1:
    - .1 Tile size: 500 mm x 500 mm x 7.2 mm (20" x 20" x 3/10") overall thickness.
    - .2 Installation pattern: Random.
    - .3 Construction: Tufted textured loop.
    - .4 Dye method: 100% solution dye.
    - .5 Acceptable *Product*:
      - .1 Interface 'Entropy'.
      - .2 Colour: TBD.

## 2.2 ADHESIVES

- .1 Carpet tile adhesive: Pressure sensitive, low VOC adhesive in accordance with carpet manufacturer's installation instructions.
- .2 Transition trim adhesive:
  - .1 Low VOC adhesive in accordance with transition material manufacturer's written installation instructions.

## 2.3 MISCELLANEOUS MATERIALS

- .1 Latex crack filler: Compatible with adhesive and recommended by carpet manufacturer.
- .2 Base: resilient base in accordance with Section 09 65 13.
- .3 Transition trim:
  - .1 Resilient transition trim:
    - .1 Tapered vinyl type as manufactured by Johnsonite or Finercraft to suit site condition for smooth transition.
    - .2 Colour to later selection by *Consultant* from manufacturer's full range.
- .4 Water vapour reduction system:
  - .1 100% solids epoxy one coat system, 0 VOC, suitable for application to 100% RH floors per ASTM F2170-11, 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%.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- .1 Ensure that environmental conditions have been provided as requested and specified
- .2 Ensure that substrates have been provided as specified without holes, protrusions, cracks or unfilled control joints or depressions that would telegraph in finished carpet installation.
- .3 Substrates shall be firm, structurally sound, sufficiently porous, and dry.
- .4 Examine substrate to ensure clean lines, correct level and freedom from cracks, ridges, dusting, scaling and carbonation.
- .5 Examine floors in advance of application of flooring to ensure that floors are protected against entry of water and moisture.
- .6 Report conditions contrary to requirements preventing proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- .7 Failure to call attention to defects or imperfections will be construed as acceptance and approval of the substrate. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.
- .8 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.

#### **3.2 PREPARATION**

- .1 Comply with recommendations of ASTM F710-11.
- .2 Substrates shall be free of wax, oil, silicone, soap, grease, dust, solvents, sealers, curing compounds, hardeners, alkaline salts, excessive carbonation or laitance, mould, mildew, paints, varnish, asphalt, residual adhesives, adhesive removers, or other contaminants or deleterious material that may inhibit bond strength or act as a bond breaker. Remove such contaminants and deleterious material using mechanical methods recommended by manufacturer. Do not use chemical abatement methods.
- .3 Flooring substrates shall be smooth and level within a tolerance of 3 mm (1/8") in a 3m (10'-0") radius.
- .4 Concrete substrates that are loose, sandy, scaly, or have a white powdery surface are not acceptable. Substrates shall be mechanically prepared.

- .5 Fill surface cracks, holes, score marks, depressions, and grooves, and repair surface spalls with Portland cement patching or levelling compound.
- .6 At door opening locations where finished flooring is adjacent to weather-stripping or automatic door bottoms *Provide* trowel-applied levelling compound to *Provide* full contact between finished flooring and weather-stripping or automatic door bottoms. Taper trowel-applied levelling compound to transition with adjacent flooring substrate to be *Provide* smooth and seamless transition at maximum slope of 3:1000 (height to distance) ratio.
- .7 Expansion joints, isolation joints, and other movement joints in substrates shall not be filled with patching or levelling compound.
- .8 Remove bumps, high spots, peaks and ridges to produce a uniform and smooth substrate.
- .9 Prepare substrates so that installation of flooring shall not show telegraphing of substrate.
- .10 Remove chalking and dusting and loose material from concrete surfaces with wire brushed or by scraping.
- .11 Sweep and vacuum clean substrates minimum 24 hours prior to alkalinity, moisture, and adhesion testing. Do not use sweeping compounds.
- .12 Notify *Consultant* of any substrate or levelling compound defects or installation conditions that may result in unsatisfactory performance.
- .13 Alkalinity, moisture, and adhesion testing:
  - .1 Perform moisture and alkalinity tests and adhesive bond test.
  - .2 Test substrates after mechanically preparing subfloor or applying patching and levelling compounds.
  - .3 Where concrete substrate exhibits higher than permitted moisture and alkalinity levels, *Provide* water vapour reduction system and repeat moisture and alkalinity tests and adhesive bond tests.
  - .4 Proceed with installation only after substrates pass testing. Document tests performed and submit in writing to *Consultant*.
  - .5 Moisture testing:
    - .1 Test for moisture vapour transmission in accordance with paragraph 1.5 Environmental Requirements.
  - .6 Alkalinity testing:
    - .1 Test for surface pH in accordance with paragraph 1.5 Environmental Requirements.
  - .7 Adhesion bond test:
    - .1 Proceed with bond test after substrates have been prepared and alkalinity and moisture test have been completed.
    - .2 Select six substrate test areas, each 915 mm (3'-0") x 915 mm (3'-0") in size. Test areas shall be spaced a minimum 1220 mm (48") apart.
    - .3 Using the specified adhesive, glue down each panel using adhesive manufacturer's recommended trowel.

- .4 After 72 hours, attempt to remove the panels of flooring by pulling up from the corners.
- .14 Allow carpet tile to relax in the installation area for a minimum of 24 hours at a temperature between 18-35°C.
- .15 Water vapour reduction system:
  - .1 Where concrete substrate exhibits higher than permitted moisture and alkalinity levels, *Provide* water vapour reduction system to protect moisture sensitive flooring system from elevated moisture and alkalinity levels.
    - .1 Shot blast floors to a International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) #3 or #4 and clean surfaces with an industrial vacuum cleaner and remove residues from the substrate. Grinding is allowed only in areas not accessible by shot blasting. Remove defective materials, and foreign matter such as dust, adhesives, levelling compounds, paint, dirt, floor hardeners, bond breakers, oil, grease, curing agents, form release agents, efflorescence, laitance, and other deleterious substances. Repair cracks, expansion joints, control joints, and open surface honeycombs and fill in accordance with water vapour reduction system manufacturer's recommendations.
    - .2 Reinforcing fibres, if applicable, that are visible after shot blasting shall be removed and vacuumed leaving no fibres left on the concrete surfaces.
    - .3 Repair concrete prior to moisture vapour reduction system installation by using water vapour reduction system manufacturer's recommended bonding emulsion with approved concrete repair materials. Comply with requirements as listed in water vapour reduction system manufacturer's technical data information. Consult with vapour reduction manufacturer.
    - .4 Shot blast a small test area and review surface profile with the finished flooring applicator. As the water vapour reduction system is not a levelling material, *Provide* feather finish or levelling material to "flatten" or level the water vapour reduction system treated concrete prior to the flooring installation.
    - .5 Apply moisture vapour reduction system monolithically to manufacturer's recommended spreading rate in number of coats to achieve manufacturer's recommended thickness.
    - .6 Consult with vapour reduction manufacturer and comply with requirements as listed in water vapour reduction system manufacturer's technical data information.
    - .7 Review surface profile with the finished flooring applicator. As the water vapour reduction system is not a levelling material, *Provide* feather finish or levelling material to "flatten" or level the water vapour reduction system treated concrete prior to the flooring installation. Flooring installation shall not show telegraphing of substrate. Flooring installation shall be homogenous free of substrate lines, pockets, bumps and unevenness.
    - .8 Verify proper adhesion of flooring adhesives, coatings, and levelling compounds to the final vapour reduction coating system for acceptability.
    - .9 Do not proceed with finished flooring installation if moisture vapour transmission exceeds maximum permitted rates.
- .16 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation. Do not use sweeping compounds.
- .17 Where flooring adjoins thicker floor materials, apply levelling screed, feather out to make up difference in level between materials.



- .18 Spray paints, permanent markers and other indelible ink markers shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and permanently stain the flooring material. If such contaminants are present on the substrate they shall be mechanically removed prior to the installation of the flooring material.

### **3.3 INSTALLATION**

- .1 Comply with CRI – Carpet Installation Standard – 2011.
- .2 Select the appropriate adhesive and trowel notch configuration recommended by the carpet, and adhesive manufacturers.
- .3 Determine quadrants by grid line of area using standard tile laying methods, or use laser alignment.
- .4 Pressure sensitive adhesive:
  - .1 Use a 200 mm (8") wide paint roller to apply adhesive full spread over substrate area.
  - .2 Allow adhesive to set until surface becomes tacky to the touch but no adhesive is transferred.
- .5 Install carpet tile in patterns as indicated.
- .6 Lay carpet tiles accurately and firmly along centre lines of selected quadrants. Follow with subsequent tiles within quadrant using 'stair-step' techniques.
- .7 As tiles are installed, frequently check all joints with fingers to ensure proper alignment. Do not install tiles that are out of alignment.
- .8 Measure out 11 carpet tiles to attain the cumulative space gained over 10 joints, which shall not exceed 6 mm (1/4"). Repeat frequently throughout installation.
- .9 Carefully butt tiles together, avoiding too much pressure which may cause peaks or buckles. Brush back face pile and tip tile into place to avoid pile being caught in joint. Anchor all cut tile and perimeter tiles with release adhesive.
- .10 Make cuts from backs of tiles using templates for fitting around columns, service cut-outs and the like.
- .11 Finish and adhere securely along the wall line; with a smooth, neat appearance where no wall base materials are indicated; and concealed beneath base materials where wall base materials are indicated. Base materials shall be installed after installation of carpet.
- .12 Install carpet accurately fitted at perimeter of rooms, cut with precision at columns, door frames and at other obstructions. At columns and other penetrations, cut carpet with maximum possible coverage.
- .13 Extend carpet tile into recesses and closets and around fixtures and service devices.
- .14 Allow no traffic over installation until adhesives have fully cured, minimum 24 hours.
- .15 Installed carpet shall be free from perceptible variance in colour, stains, baldness, tears, fraying, patchwork, and other defects detrimental to good performance and appearance.

### **3.4 INSTALLATION - TRANSITION TRIM**

- .1 Coordinate transitions with work of other sections and install transition trim to transitions between carpet tile flooring and adjacent flooring.

- .2 Allow coiled vinyl material to lay flat for at least 24 hours at 21°C prior to installation.
- .3 Set to ensure installation is free of gaps.
- .4 Install in longest lengths possible.
- .5 Install straight to maximum allowable variation of 1:1000.
- .6 Scribe and fit to obstructions.
- .7 Fit joints tightly, straight and vertical as applicable and not less than 610 mm (24") from corners.
- .8 Cope mitre corners.

### **3.5 SERVICE MARKING**

- .1 *Provide* +/-25 mm (1") diameter contrasting colour dots of carpet, inserted using a carpet punch to mark electrical and mechanical access panels in floors. *Provide* cut-out and carpet tile inserts to suit access panels.

### **3.6 FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00.

### **3.7 ADJUSTING AND CLEANING**

- .1 After installation is completed, clean and vacuum carpet of dirt, dust and foreign materials. Remove spots with suitable spot remover, remove cuttings, vacuum carpet thoroughly using approved commercial type equipment and leave clean.
- .2 Cover with protective membrane, lapping joints 100 mm (4") with adhesive tape.

**END OF SECTION**

## **PART 1– GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Closeout Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Delivery, Storage, and Handling
- .8 1.8 Field Conditions
- .9 1.9 Extended Warranty
- .10 2.1 Performance/Design Requirements
- .11 2.2 Materials
- .12 3.1 Examination
- .13 3.2 Preparation
- .14 3.3 Application - Primers
- .15 3.4 Installation
- .16 3.5 Mechanical and Electrical Items
- .17 3.6 Field Quality Control
- .18 3.7 Patching
- .19 3.8 Adjusting and Cleaning
- .20 3.9 Schedules
- .21 3.10 Schedule - Interior Finishes
- .22 3.11 Schedule - Exterior Finishes
- .23 3.12 Schedule – Colours

### **1.3 SUMMARY**

- .1 Section includes
  - .1 Interior painting.
  - .2 Exterior painting.
- .2 Extent of *Work*
  - .1 Paint and finish 'paintable' surfaces for area of the *Work* indicated in the *Contract Documents*.
  - .2 The following surfaces are considered 'non-paintable' for purposes of this *Contract*. Omit painter's finishes from following items:

- .1 Material and equipment furnished completely prime and finish painted by manufacturer;
- .2 Internal surfaces of steel tanks and stacks;
- .3 Sprayed fire-resistant materials;
- .4 Exterior concrete including building walls, building floors and pavements, except as otherwise indicated in the Contract Drawings.
- .5 Stainless steel, weathering steel, copper, bronze, chromium plate, nickel, anodized or lacquered aluminum, and monel metal;
- .6 Exposed insulation, glass, plastic, brick, stone, resilient floors, treads and bases, tile and hardware;
- .7 Prefinished metals, unless required to be colour coded.
- .8 Metallic and mastic insulation finishes;
- .9 Abrasive material finishes on floors, stair treads, stair nosings and landings;
- .10 Insulated electric cables;
- .11 Machined parts of machinery and equipment.
- .12 Concealed surfaces.

#### 1.4 SUBMITTALS

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data and list of *Products*:
  - .1 At least 60 *Days* before the work of this Section commences, submit name of paint manufacturer whose *Products* are proposed for use in the *Work* along with a complete list of *Products* intended for use in *Work*, prepared by paint manufacturer. Indicate manufacturer's official certification that *Products* listed thereon are the top quality made by the company unless otherwise indicated in this Section.
  - .2 The list must indicate the name of paint manufacturer, the catalogue number, grade, and quality of the *Products* proposed for use, and be correlated to the schedule furnished by the *Consultant*.
  - .3 The list must be accompanied by manufacturer's *Product* data sheets for each *Product* listed.
  - .4 *Products* delivered to the *Place of the Work* must conform to the reviewed list of *Products*.
- .3 Samples:
  - .1 Submit samples of various finishes for the *Consultant's* approval, at least 30 *Days* before materials are required.
  - .2 Sample surfaces:
    - .1 Use 50 mm (2") concrete block for finishes over concrete or concrete masonry surfaces.
    - .2 Use 3.2 mm (1/8") thick plate steel for finishes over metal surfaces.
    - .3 Use 12.7 mm (1/2") thick birch plywood for finishes over wood surfaces.

- .4 Use 12.7 mm (1/2") gypsum board for finishes over gypsum board and other smooth surfaces.
- .3 Where possible identify each sample as to *Project*, finish, formula, colour name, number, sheen name and gloss values, date and name of the *Contractor* and painting *Subcontractor*.
- .4 Resubmit as required until colours and gloss value are approved.
- .4 Colours:
  - .1 Prior to beginning painting work, the *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*.
- .5 Master Painters Institute (MPI) Architectural Painting Specification Manual (MPI Manual):
  - .1 Submit 1 copy of MPI Manual – latest edition and maintain at *Site* office for reference.

### 1.5 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .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 two sealed containers, each of four litres (one gallon) capacity of each paint *Product* in each colour used in the work for the *Owner's* maintenance use. Containers must be new, clearly labelled with manufacturer's name, type of paint, colour and colour number. Store at the *Place of the Work* where directed by the *Owner*.

### 1.6 QUALITY ASSURANCE

- .1 Qualifications
  - .1 Installers / applicators / erectors:
    - .1 The *Contractor* shall ensure that applicators have minimum of five years proven satisfactory painting experience of projects of similar size and class subject to the *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 the *Consultant*, under lighting conditions matching final area lighting, for acceptance by the *Consultant*. Locate at the *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: one door and frame for each finish specified.
    - .3 *Site* painted structural steel.

- .2 Upon completion and approval by the *Consultant*, 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 the standard must be repainted at no cost to the *Owner*.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to the *Place of the Work* in sealed original containers with labels intact and store in space directed by *Consultant*. Keep stored materials covered at all times. The presence of any unauthorized material or containers for such at the *Place of the Work* shall be sufficient cause for rejection of all paint materials at the *Place of the Work* at that time.
- .2 Exercise extreme caution in the storage of materials to prevent fire or that may create fire hazards. Thinners and solvents shall be stored in Canadian Standards Association (CSA) approved metal safety containers in accordance with City of Markham fire and safety regulations.
- .3 In areas of storage, protect floor and wall surfaces from paint drips. Protect floors with sheets or clean plywood or metal pans where mixing is being carried out. *Provide* and maintain fire extinguishers, accessible in storage and mixing areas.
- .4 Leave storage areas clean and free from evidence of occupancy when these are required for intended use.
- .5 Keep waste rags in metal drums containing water and remove from the *Place of the Work* at the end of each *Working Day*.
- .6 *Provide* labels on each container, correlated to the reviewed list of *Products*, with the following information
  - .1 Name of title of *Product*.
  - .2 Manufacturer's stock number.
  - .3 Manufacturer's name.
  - .4 Contents by volume, for major pigment and vehicle constituents.
  - .5 Thinning instructions.
  - .6 Application instructions.

## 1.8 FIELD CONDITIONS

- .1 Comply with environmental requirements of Master Painting Institute (MPI) Manual.
- .2 Areas shall be clean and dust free before painting is commenced.
- .3 Make thorough examination of the complete the *Contract Documents* to determine intent, extent, materials, types of surfaces, and locations requiring painting and be fully cognizant of requirements.
- .4 Use sufficient clean drop cloths and protective coverings for full protection of floors, furnishings and work not being painted. Protect mechanical, electrical and special equipment and all other components of building which do not require painting from paint spotting and other soiling during painting process. Mask adjoining work adjacent to work being painted or carefully cut in without overlaps. Clean surfaces soiled by spillage of paint and paint spatters. If cleaning operations damage the surface, repair or replace damaged work at no extra cost to the *Owner*.
- .5 Do not paint over dust, rust, scale, grease, moisture, scuffed surfaces or conditions otherwise detrimental to the formation of a durable paint film.

- .6 The *Contractor* shall be responsible for damage to the work of this Section until the building is complete and accepted by the *Consultant*. In cases of damage, surfaces shall be cleaned and repainted, at the *Contractor's* expense, to the *Consultant's* approval.
- .7 Do not paint exterior surfaces at temperatures below 10°C for latex *Products* and below 10°C for solvent based *Products*, nor in rainy conditions or high humidity (maximum relative humidity shall be 85%). Avoid applying paint to surfaces when exposed to direct sunlight. Do not paint interior surfaces at temperatures under 10°C, nor on surfaces where condensation has or will form due to presence of high humidity and lack of proper ventilation.
- .8 *Provide* ventilation to remove odours, evaporating solvents and moisture.
- .9 Check moisture content of surfaces to be painted using electronic moisture meter approved by paint manufacturer and the *Consultant*, or other approved method directed by the Consultant. Maximum moisture contents shall be in accordance with manufacturer's recommendations and as follows:
  - .1 Concrete and concrete masonry: Maximum 12% to 14% for solvent coatings, and as recommended by manufacturer for water-based coatings.
  - .2 Gypsum board and plaster: Maximum 12% to 14%.
  - .3 Wood: Maximum 15%.

## 1.9 EXTENDED WARRANTY

- .1 Warrant work of this, in accordance with Section 01 78 36 - Warranties.
- .2 Throughout the 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 CAN/CGSB 85.100 Painting.
- .3 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 Master Painting Institute (MPI) Accredited Quality Assurance Association having jurisdiction.

## 2.2 MATERIALS

- .1 Acceptable *Products*:
  - .1 *Products* by ICI Paints, Benjamin Moore Co. Ltd., Sherwin-Williams Co., or Pratt & Lambert Ltd. or *Equivalent* shall be used in the *Work*.
- .2 Paints and coatings materials used within the weatherproofing system shall not exceed the Volatile Organic Compound (VOC) content limits of the following criteria.
  - .1 Interior paints and coatings: in accordance with Green Seal GS-11 VOC limits:
    - .1 Flat coating type: 50 gm/L.
    - .2 Non-flat coating type: 100 gm/L.
  - .2 Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Green Seal Standard GC-03, Anti-Corrosive Paints.
  - .3 Clear wood finishes, floor coatings, stains, and shellacs applied to interior elements: South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings.
- .3 Paint and finishing materials shall be highest grade, manufacturer's first line quality (not "*Contractor's*" first line).
- .4 Paint and coating materials for each system shall be *Products* of a single manufacturer.
- .5 *Provide* safe and adequate equipment, scaffolding, ladders, plant, tools, brushes, rollers, clean drop cloths and other items required for the completion of the work.
- .6 Undercoatings and primers shall be made for the purpose of the finishing materials being used.
- .7 Brushes, rollers, and the like shall be the best of their respective kinds, clean and suitable for the work.
- .8 Joint sealants: in accordance with Section 07 92 00 – Joint Sealants.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- .1 Prior to commencement of work of this Section, thoroughly examine surfaces scheduled to be painted.
- .2 Check surfaces with electric moisture meter and do not proceed if reading is higher than 12-15% or as otherwise required by paint or coating manufacturer.
- .3 Check surfaces to determine if pH of surfaces meet manufacturer's requirements.
- .4 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.
- .5 Report in writing any condition adversely affecting the work under this Section.
- .6 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 all 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 Prepare existing surfaces to be repainted in accordance with Article 6.2 of CAN/CGSB 85.100-93.
- .3 Clean floors, adjacent surfaces and surfaces to be painted before work is commenced.
- .4 Before commencement of work, remove electric plates, surface hardware, canopies of lighting fixtures, and other escutcheons and appurtenances. Mask adjacent items that are not removable. Replace items removed, when paint is dry and clean them. Use cleaning methods that will not damage finish.
- .5 Use sufficient drop cloths and protective coverings for the full protection of work not to be painted or coated.
- .6 Keep waste rags in covered metal drums containing water and remove from building at end of each *Day*.
- .7 Shut down motors, fans, and mechanical ventilation systems during spray painting. Shut down air intakes in affected areas and ventilate to exterior, when applying noxious smelling or Volatile Organic Compound (VOC) containing paints and coatings.
- .8 Exposed concrete and concrete block walls which are scheduled to be painted or sealed shall not be painted or sealed until the sealant has been applied at control joints and joints with hollow metal frames.
- .9 Materials shall be thoroughly mixed before application and applied without cutting or admixture except as indicated in writing by the manufacturer.
- .10 Metal:
  - .1 Clean unpainted and shop primed metal to *Provide* satisfactory surfaces to receive overcoats and *Provide* permanent adhesion of coatings. Remove rust and scale with emery paper and wire brushes. Prime bare metal, make good shop primed metal where abraded, feather out edges to make touch-up patches inconspicuous. Thoroughly clean metal surfaces including piping and ductwork of oil and grease with mineral spirits.
  - .2 Remove loose paint and scale from shop primed metal work.
- .11 Concrete and Masonry:
  - .1 Thoroughly clean from oil, parting compounds, curing compounds and other incompatible materials from concrete surfaces.
  - .2 Thoroughly clean masonry and concrete surfaces to be painted free of mortar droppings, concrete spotter and extraneous matter.
  - .3 Check concrete and masonry surfaces to be painted for alkalinity with pink litmus paper or other recognized method. Where extreme alkalinity occurs (6.8 - 8.0 range) wash surface with tetra potassium solution where latex base paint is to be used and with zinc sulphate solution where oil base paints are to be used. Rinse with clean water and allow to dry thoroughly prior to application of primer.
- .12 Gypsum Board:

- .1 Ensure that gypsum board joints are smooth and board is clean and free of jointing compound spatter.
- .2 Test surfaces for alkalinity with pink litmus paper or other recognized method.
- .13 Metal Surfaces; Galvanized:
  - .1 Apply cold phosphate surface treatment in accordance with SSPC-PT2-82 to unpassivated zinc-coated metal.
  - .2 For passivated zinc-coated metal ("white rusted"), power wire brush or vigorously hand wire brush to scuff galvanize thoroughly, and solvent clean in accordance with SSPC-SP1-82.
  - .3 Prepare exterior exposed galvanized steel and galvanized steel at wet areas in accordance with SSPC-SP7 – Sweep Blast.
- .14 Woodwork:
  - .1 Sand wipe off dust and grit before prime coat application. Putty nail holes and minimal cracks after primer has dried; sand between primer and top coats with No. 300 sandpaper and remove dust.

### 3.3 APPLICATION - PRIMERS

- .1 Completely prime surfaces of exterior wood to receive paints or coatings.
- .2 Apply primer coats to steel and galvanized steel surfaces that have and have not received shop coat or primer.
- .3 Finish and back prime wood components prior to their installation.
- .4 When primer sealer is dry, touch up visible suction spots before the next coat is applied and do not proceed with the work until suction spots are sealed.
- .5 Use high-build type primer/sealers at glass mat finished gypsum board substrate.

### 3.4 INSTALLATION

- .1 Apply to surfaces scheduled to be finished. Apply materials in accordance with manufacturer's printed directions.
- .2 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.
- .3 Paint shall be applied by means of brushes, except for wall and ceiling surfaces that shall be applied by rollers or spray application. Apply varnish by brush. Apply stain by wiping.
- .4 The *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.
- .5 Apply coats only when the previous coat is dry/cured, in accordance with manufacturer's printed installation instructions.
- .6 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.

- .7 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.
- .8 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.
- .9 Arrange to have traffic barred from completed areas wherever possible or *Provide* adequate protection to prevent contamination of paints or coatings with foreign substances.
- .10 Tint filler to match wood to receive clear finishes, where filler is required. Work filler well into grain and before it has set wipe excess from surface.
- .11 Prime woodwork designed for painting immediately after woodwork is delivered to *Site*. Prime surfaces of such woodwork, exposed and semi-exposed, before installation. Back-prime woodwork indicated to receive transparent finish with one coat of specified transparent finish reduced 25%.
- .12 Sand semi-gloss, medium and high gloss finishes lightly between coats. Sand and dust between each coat to remove defects visible from distance of 1.5 m (5 ft).
- .13 Reseal cut edges of wood doors and seal unfinished tops and bottoms of wood doors with three coats of polyurethane sealer.
- .14 Finishes and number of coats indicated are the minimum required. Apply further coats until complete uniform coverage is achieved to suit paint *Products* and colours.
- .15 Priming coat shall be colour toned lighter than second coat and the second coat shall be toned lighter than finish coat. Only the finish coat shall match the colour of the accepted samples.
- .16 Paint inside surfaces of light coves white unless otherwise indicated in the *Contract Documents*.
- .17 Grilles and perforated items shall be spray painted. Do not block perforations and apply evenly to present consistent appearance free from defects visible from distance of 1.5 m (5 ft)
- .18 Do not apply paints and coating over fire rating labels.
- .19 Do not apply paints and coatings over identification labels on mechanical and electrical equipment.
- .20 Paint removable and operable items, such as access panels and doors, grilles, and similar items, while the item is removed or open, so as to not create a paint seal at the juncture of the opening or removable item and its fixed frame or substrate.
- .21 Keep sprinkler heads, fire detection equipment, and smoke detection equipment free of paint.
- .22 Repaint existing surfaces and finishes where scheduled, where alterations or renovations have been carried out, and where surfaces have been disturbed by the alterations or renovations. Repaint surfaces entirely between changes of plane.
- .23 Paint both sides and edges of plywood backboards for equipment before installation.

### 3.5 MECHANICAL AND ELECTRICAL ITEMS

- .1 Finish paint primed mechanical and electrical items with two coats of paint. Include for the following list unless otherwise indicated in the *Contract Documents*:
  - .1 Conduit

- .2 Ductwork
- .3 Hangers
- .4 Stacks
- .5 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 *Subcontractor* 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 in the Contract Document.
- .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 the *Consultant*.
- .6 Gas pipes, whether concealed or exposed, shall be painted in yellow-orange colour, in accordance with Ontario gas utilization code.
- .7 Paint fire protection piping for sprinklers with self priming rust paint, Para Paint colour 1133 Red or *Equivalent* in the following locations:
  - .1 Apparatus bays.
  - .2 Utility room.
  - .3 Generator room.
  - .4 Elsewhere where exposed.
- .8 Paint gas piping with self priming rust paint, yellow colour in the following locations:
  - .1 Apparatus bays.
  - .2 Utility room.
  - .3 Generator room.
  - .4 Elsewhere where exposed.

### **3.6 FIELD QUALITY CONTROL**

- .1 Field quality control shall be in accordance with Section 01 45 00 – Quality Control, as supplemented in this Section.

### **3.7 PATCHING**

- .1 Do retouching to ensure that the work is handed over to the *Owner* in proper condition, free of runs, spatter, finger marks, rust, watermarks, scratches, blemishes or other disfiguration, with full, even coverage.
- .2 After fully painting, retouching and finishing a room or area, notify the *Consultant*. After review and acceptance by the *Consultant*, post sign "Painting Complete - No Admittance Without Permission".

### 3.8 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.

### 3.9 SCHEDULES

- .1 Finish Schedule:
  - .1 Assume full responsibility for painting and varnishing of all materials of the *Contract* exposed in the finished work which do not already have finished surfaces and that normally require paint or varnish finish. Inspect surfaces over which the work of this Section is dependent for unevenness, cracks, surface defects, moisture, cleanliness, roughness and other irregularities detrimental to the application and performance of the work. Confirm conditions satisfactory before proceeding. Failure in complying with this section or failure to have unsatisfactory conditions corrected before proceeding, shall not relieve the *Contractor* of responsibility for required results.
  - .2 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.
  - .3 In instances where materials specified are not suitable for particular application or are contrary to manufacturer's recommendations for use on particular surface, immediately bring to attention of the *Consultant* for clarification and instructions.
  - .4 Where finishing formula for surfaces requiring paint is not specified, follow recommendations of MPI Manual as follows:
    - .1 Interior painting: Custom Grade.
    - .2 Exterior painting: Custom Grade.
  - .5 The *Consultant* shall have right to make changes in colour tone of finishes prior to final coat to obtain desired results without additional cost to the *Owner*.
  - .6 Unless otherwise noted or scheduled in the *Contract Documents*, walls shall be painted the same colour within a given area.
  - .7 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 in the *Contract Documents*.
- .2 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI values:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat finish	0 to 5	10 maximum
G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	35 minimum
G5	Semi-Gloss finish	35 to 70	

G6	Gloss finish	70 to 85	
G7	High-Gloss finish	> 85	

### 3.10 SCHEDULE - INTERIOR FINISHES

- .1 System references listed are based on MPI Manual and are Custom Grade, Low VOC (Green Seal GS-11), unless otherwise indicated in the *Contract Documents*:
  - .1 Formula 1: for concrete block walls, except those noted for Professional Wood Finish (PWF):
    - .1 One coat latex block filler.
    - .2 Two coats latex semi-gloss.
  - .2 Formula 2: for concrete block walls noted to receive PWF gloss finish coat:
    - .1 One coat latex block filler.
    - .2 Two coats high build epoxy coating.
  - .3 Formula 3; for gypsum board walls apply:
    - .1 One coat latex primer sealer.
    - .2 Two coats latex semi-gloss.
  - .4 Formula 4: for gypsum board ceilings apply:
    - .1 One coat latex primer sealer.
    - .2 Two coats latex semi-gloss.
  - .5 Formula 5: for wood to receive paint finish apply:
    - .1 One coat stain blocking/adhesion promoting primer (waterborne).
    - .2 Two coats latex semi-gloss.
  - .6 Formula 6: for primed ferrous metal surfaces apply:
    - .1 One coat latex dryfall.
    - .2 High traffic surfaces – custom system:
      - .1 One coat high performance primer (waterborne).
      - .2 Two coats latex
  - .7 Formula 7: for galvanized and zinc coated metal apply:
    - .1 One coat galvanized primer (waterborne).
    - .2 Two coats latex
    - .3 For ceiling and ductwork areas apply:
      - .1 One coat galvanized primer (waterborne).
      - .2 One coat latex dryfall.
  - .8 Formula 8: for woodwork to receive stained finish apply custom system:

- .1 One coat stain.
- .2 Three coats waterborne polyurethane clear.
- .9 Formula 9: for woodwork to receive natural finish apply:
  - .1 Three coats waterborne polyurethane clear.
- .10 Formula 10: for insulation covering apply:
  - .1 One coat latex primer sealer.
  - .2 Two coats latex

### **3.11 SCHEDULE - EXTERIOR FINISHES**

- .1 System references listed are based on MPI Manual and are Custom Grade, unless otherwise indicated in the *Contract Documents*:
  - .1 Formula 11 (Alkyd): for pavement markings (parking lines and symbols) on asphalt concrete pavement:
    - .1 Alkyd traffic paint, number of coats according to manufacturer's recommendations.
  - .2 Formula 12 (Alkyd): for shop primed ferrous exterior metal surfaces noted for paint, apply:
    - .1 Touch-up with shop primer as provided by fabricator.
    - .2 One coat oil alkyd metal primer.
    - .3 Two coats exterior alkyd enamel.
  - .3 Formula 13 (Alkyd): for galvanized and zinc coated exterior metal surfaces noted for paint:
    - .1 One coat cementitious primer.
    - .2 Two coats exterior alkyd enamel.

### **3.12 SCHEDULE – COLOURS**

- .1 Refer to the *Drawings* for painting color and location.
- .2 All exposed exterior and interior Steel shall be painted. The *Contractor* shall confirm color with the *Consultant*.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Closeout Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Delivery, Storage, and Handling
- .8 1.8 Extended Warranty
- .9 2.1 Design/Performance Requirements
- .10 2.2 Tackboards
- .11 2.3 Marker Boards (Whiteboards)
- .12 2.4 Trim Components
- .13 2.5 Fastenings
- .14 3.1 Examination
- .15 3.2 Installation - Tackboards
- .16 3.3 Installation –Marker Boards
- .17 3.4 Installation – Trim Components
- .18 3.5 Installation Tolerances
- .19 3.6 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section Includes
  - .1 Tackboards.
  - .2 Marker boards (whiteboards).
  - .3 Related trim, adhesives, and fastenings.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 proposed system of anchorage and materials being supplied on *Shop Drawings* submitted to the *Consultant* for review.
- .2 Show dimensional layouts, hardware items, anchorage devices, dimensions, description of materials and finishes, and all other pertinent information.
- .4 Samples:
  - .1 Submit 305 mm x 305 mm (12" x 12") samples of each *Product* specified, diagonally cut to show cross section through assembly, complete with accessories and trim.

## 1.5 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 - Contract Closeout Procedures and Submittals.
- .2 Operation and maintenance data:
  - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Installers / applicators / erectors:
    - .1 The *Contractor* shall ensure that the erection of materials is carried out by competent workers supervised by a foreperson with at least 10 years' experience in this specialized field and approved in writing by manufacturer for installation of their *Product*.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Package *Products* to prevent distortion in shipment and handling. Label and protect finish surfaces by sturdy wrappings.

## 1.8 EXTENDED WARRANTY

- .1 Warrant work of this Section in accordance with Section 01 78 36 – Warranties for a period of 10 years from the date of Substantial Performance.

## PART 2 - PRODUCTS

### 2.1 DESIGN/PERFORMANCE REQUIREMENTS

- .1 Trademarks and Labels
  - .1 No trademarks or labels will be accepted on exposed finished work.

### 2.2 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") particle board 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 Colour of tackboard to be selected by the *Consultant* from manufacturer's standard colour range.

- .2 Acceptable manufacturers:
  - .1 Architectural School Products (a.s.p.).
  - .2 Delta Products Ltd.
  - .3 Or *Equivalent*.

## 2.3 MARKER BOARDS (WHITEBOARDS)

- .1 Porcelain enamel board with porcelain enamel writing surface on 0.8 mm (.03") (22 gauge) high quality enameling steel base, 11.1 mm (0.44") impregnated fibreboard core and 0.4 mm (0.02") (28 gauge) stretcher levelled zinc coated back sheet. Writing surface and back sheet laminated in one piece under mechanical or hydraulic pressure to core.
  - .1 White colour writing surface, designed for long lasting heavy duty marker writing surface, free of permanent marker staining.
  - .2 Joints shall be absolutely flush and level, plumb true with edges finished square and fitted as closely as possible. Concealed mechanical joining system: integral, slotted, Polyvinyl Chloride (PVC) insert laminated into ends of panels and 25 mm (1") wide, 2 mm (0.08") thick, galvanized steel spline.
  - .3 Particle board backing to CAN3-0188.1-M78, 6 mm (1/4") thick, with sanded faces.
  - .4 Porcelain writing surface: 0.076 mm (0.003") thick porcelain enamel to Porcelain Enamel Institute Standards PEI 104. Gloss factor: 6-8 as measured by 45° glossmeter.
  - .5 Aluminum trim: in accordance with Trim Components paragraph below.
  - .6 Acceptable manufacturers:
    - .1 Architectural School Products (a.s.p.).
    - .2 Delta Products Ltd.
    - .3 Global School Products Inc.
    - .4 Or *Equivalent*.
  - .7 Magnetic Markerboard: Skyline design 'Vitracolor Magnetic Markerglass' or equivalent.
  - .8 Substitutions: In accordance with Section 01 25 00 – Product Substitution Procedures.
  - .9 Dimensions: Refer to the *Drawings*.
  - .10 Options:
    - .1 Use screws of galvanized steel.

## 2.4 TRIM COMPONENTS

- .1 Extruded aluminum components, AA6063 T5.
- .2 Tackboards:
  - .1 Aluminum trim and accessories:
    - .1 Perimeter: a.s.p. No. 505. or *Equivalent*.
- .3 Marker boards:

- .1 Acceptable Products:
  - .1 Perimeter: a.s.p. No. 505.
  - .2 Chalktray: a.s.p. No. 521.
  - .3 Or *Equivalent*.

## **2.5 FASTENINGS**

- .1 Reinforcing anchor plates to be galvanized steel plates conforming to CSA G4-09(2014).
- .2 Use screws, bolts of galvanized steel or aluminum.
- .3 Ferrous metal not specified must be plated or baked enamel and treated with primer conforming to CAN/CGSB 1.140-M91.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Prior to commencement of erection by the installing *Subcontractor*, the *Contractor* shall ensure that the installing *Subcontractor* checks surfaces for irregularities, trueness and rigidity and projections and defects and immediately report any in writing to the *Contractor*.
- .2 Commencing installation implies acceptance of surface conditions.

### **3.2 INSTALLATION - TACKBOARDS**

- .1 Secured from behind and mounted in accordance with manufacturer's written instructions to the satisfaction of the *Consultant*.
- .2 *Install* secure, plumb and square.
- .3 Secure wall brackets to blocking in stud walls, or with zinc plated metal expansion type anchors at masonry back-up.
- .4 Locate seams as directed by the *Consultant*.

### **3.3 INSTALLATION –MARKER BOARDS**

- .1 *Install* in accordance with manufacturer's written installation instructions.
- .2 Secure wall brackets to blocking in stud walls, or with zinc plated metal expansion type anchors at masonry back-up.
- .3 Join panels together by use of 14 gauge x 25.4 mm (1") wide steel spline and extruded polyvinyl slotted insert for flush butt joints, with a hairline appearance.
- .4 Locate seams as directed by the *Consultant*.

### **3.4 INSTALLATION – TRIM COMPONENTS**

- .1 *Install* in accordance with manufacturer's written installation instructions.
- .2 Attach aluminum trim, where applicable, in such a manner that fastenings shall be concealed. Fastening shall be accomplished by the use of #10 x 25.4 mm (1") steel wood screws with rawl plugs, attached to walls.

- .3 Leave trim and surfaces clean and free of stains or marks and completely cover finished surfaces with "Plioilm" or equivalent immediately after installation and remove only at time of final inspection.

### **3.5 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 in the Contract Drawings: plus/minus 3 mm (1/8").

### **3.6 ADJUSTING AND CLEANING**

- .1 Verify under work of this Section that installed *Products* function properly and adjust them accordingly to ensure satisfactory operation.
- .2 Do not remove protective coatings until final cleaning, or earlier if directed by the *Consultant*.
- .3 Refinish damaged or defective work, at the *Contractor's* expense, so that no variation in surface appearance is discernible. Refinish work at the *Place of the Work* only if approved by the *Consultant*.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Closeout Submittals
- .6 1.6 Delivery, Storage, and Handling
- .7 2.1 York Region Corporate Colours
- .8 2.2 Font
- .9 2.3 Braille and Tactile Letters
- .10 2.4 Symbols/Pictograms
- .11 2.5 Materials
- .12 3.1 Installation of interior signage
- .13 3.2 Cleaning

### **1.3 SUMMARY**

- .1 Section Includes
  - .1 Interior Signage

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for signage and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit catalogue sheets Full size templates.
  - .2 Indicate materials, thicknesses, sizes, finishes, colours, construction details, removable and interchangeable components, mounting methods, schedule of signs.
  - .3 Submit drawn-to-scale details for individually fabricated or incised lettering indicating word and letter spacing.
- .4 Samples:

- .1 Submit representative sample of each type sign, sign image and mounting method including, but not limited to: graphics, raised tactile characters, Braille, sign box installation method, channel letters, and wall plates fixed mounting installation method.
- .2 Schedule:
  - .1 Submit signage schedule for DCC Representative review. Schedule to include as a minimum: Sign type, Location Room Number, Sign Text, Pictogram, Mounting Type.
  - .2 Do not proceed with fabrication until schedule has been accepted in writing by DCC Representative.

## **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .2 Operation and maintenance data:
  - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location and in accordance with manufactures recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **PART 2 – PRODUCTS**

### **2.1 YORK REGION CORPORATE COLOURS**

- .1 The following colors shall only be used for all interior signs:
  - .1 Pantone 287C Blue (PMS 287C)
  - .2 White
  - .3 Black
- .2 Interior signs shall be Pantone 287C (PMS 287C) blue background with white text and graphics.
- .3 Ensure signage surfaces have matte finish
- .4 For exterior signs, the preferred colour combination is PMS 287C blue background with white text and graphics, however the reverse combination (white background with blue text and graphics) may be used if necessary to provide colour contrast to the background surface.

### **2.2 FONT**

- .1 The following font shall only be used for all interior signs:

- .1 Futura Medium
- .2 Ensure Arabic numerals are used for numbers.
- .3 Use upper- and lower-case combinations; do not use all capitals.
- .4 Use a regular weight; do not use very fine type or very heavy type.
- .5 Do not stretch or condense fonts.
- .6 Ensure consistent use of fonts, colours and graphics.

## **2.3 BRAILLE AND TACTILE LETTERS**

- .1 Braille shall be of "Raster" method e.g. holes drilled and ball bearings inserted suitably rounded for easy reading. Braille dots must have a domed or rounded shape. Brailing process used and applied on signage shall not be susceptible to vandalism. Braille shall be integral to sign surface/design
- .2 Tactile signs shall have lettering and graphics that are raised 0.8mm to 1.5mm (1/32" to 1/16") above the surface of the sign. They are most useful for people with no sight at all or for people whose visual capability will enable them to locate a sign but not to identify individual characters without touching the lettering.
- .3 Tactile and braille markings shall supplement the text of:
  - .1 Regulatory signs such as prohibition and mandatory signs;
  - .2 Warning signs, such as caution and danger signs;
  - .3 Permanent identification signs for staircases, elevators and washrooms;
  - .4 Doors and openings that lead to a public place
- .4 Braille is required to be lowercase, except for Proper nouns, names and the first word of sentences or individual letters of the alphabet.
- .5 The braille text/characters shall always be placed in the same relative position, mounted near the bottom edge of signage, below other text, symbols or tactile characters. If text is multi-lined, braille shall be placed below entire text.
- .6 Ensure braille text is separated a minimum of 9.5mm (3/8") from any other tactile characters.
- .7 If raised borders around signage are used, ensure border is separated a minimum of 9.5mm (3/8") from any tactile or braille print.
- .8 Grade 1 braille is letter-for-letter scheme and is to be used on signs with 10 words or less.
- .9 Grade 2 braille contains over 200 contracted words and word fragments and is to be used on signs with more than 10 words.
- .10 Where tactile characters are used, ensure edges are beveled and smooth.

## **2.4 SYMBOLS/PICTOGRAMS**

- .1 Standard International Pictograms shall be used to supplement text and for referencing common building amenities such as washrooms, stairs and elevators.
- .2 Symbols and pictograms shall be used on both regular and tactile signs.

- .3 Refer to drawings for Symbols/Pictograms used for project.

## **2.5 MATERIALS**

- .1 Acceptable Product:

- .1 DanSign Curve with a magnetic locking system, as supplied by The Brothers Markle.

- .1 Material:

- .1 Lacquered ABS with extruded aluminum brackets

- .2 Message:

- .1 Vinyl room number on header panel and vinyl room name on body panel.

- .3 Graphic:

- .1 White on PMS 287C.

- .4 Installation:

- .1 Mounted at 1500mm (5'0") to centreline above the finished floor and 150mm (6") away from the door frame.

- .2 DanSign Paperflex Curve with a magnetic locking system, as supplied by The Brothers Markle.

- .1 Material:

- .1 Lacquered ABS with extruded aluminum brackets

- .2 Message:

- .1 Vinyl room number on header panel and paper insert with room name or Occupant's name

- .3 Graphic:

- .1 White on PMS 287C.

- .4 Installation:

- .1 Mounted at 1500mm (5'0") to centreline above the finished floor and 150mm (6") away from the door frame.

## **PART 3- EXECUTION**

### **3.1 INSTALLATION OF INTERIOR SIGNAGE**

- .1 Signs shall be mounted on the latch side of the door.
- .2 Signage for doors shall be consistently placed; 150 mm (6") from the door jamb.
- .3 Signs for doors shall be mounted with the horizontal centreline 1500mm (5'-0") from the floor. Be consistent with sign height throughout the building.
- .4 Where there are double doors, signs shall be placed on both sides of doors.
- .5 Where double-leaf doors are used or no wall space adjoin the door's latch edge, signs shall be mounted on the nearest adjacent wall.



- .6 Tactile signs shall be mounted to allow a person to approach the sign to within 100mm (4") without encountering protruding objects or standing within a door swing.

### **3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 13 – Progressive 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 13 – Progressive Cleaning.
  - .1 Leave signs clean.
  - .2 Remove debris from interior of sign boxes.
  - .3 Touch up damaged finishes.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 References
- .4 1.4 Shop Drawings
- .5 1.5 Closeout Submittals
- .6 2.1 Description
- .7 2.2 Materials
- .8 2.3 Finishes
- .9 3.1 Installation
- .10 3.2 Protection

### **1.3 REFERENCES**

- .1 ASTM A123/A123M-17: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A153/A153M-16a: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .3 ASTM A307-14e1: Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- .4 ASTM A563M-07(2013): Standard Specification for Carbon and Alloy Steel Nuts (Metric).
- .5 ASTM A1008/A1008M-16: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- .6 ASTM B456-11e1: Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .7 ASTM F436M-11: Standard Specification for Hardened Steel Washers.

### **1.4 SHOP DRAWINGS**

- .1 Submit Shop Drawings as specified in Section 01 33 00.
- .2 Shop Drawings: Project-specific drawings, illustrating sign design and layout, materials, sizes, thicknesses, methods of attachment, and special details.

### **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit closeout submittals as specified in Section 01 78 00.
- .2 Maintenance Data: Manufacturer's standard installation and maintenance instructions, sufficient quantity for inclusion in the operation and maintenance manuals.

## **PART 2 - PRODUCTS**

### **2.1 DESCRIPTION**

- .1 Traffic and Emergency Signage: Sheet steel, conforming to local municipality standards; reflective baked enamel finish; sufficient quantity to conform to the requirements of the Authorities Having Jurisdiction; styles and designs as indicated on Drawings.

### **2.2 MATERIALS**

- .1 Sheet Steel: Cold-rolled steel sheet to ASTM A1008/A1008M, Commercial Steel (CS) Types A, B, and C; galvanized.
- .2 Bolts: Carbon and alloy steel, to ASTM A307, Grade A; hot dipped galvanized.
- .3 Nuts: Carbon and alloy steel, to ASTM A563M, Grade A, Hex Style; hot dipped galvanized.
- .4 Washers: Hardened steel washers, to ASTM F436M, Type 1 for interior applications, Type 3 for exterior applications; circular, beveled and clipped types as required.
- .5 Sign Posts: Galvanized steel, square-shaped stakes; complete with regularly spaced drilled holes for attachment of signage; suitable length to accommodate buried depth of not less than 1.0 metre and sign mounting height in accordance with the authority having jurisdiction; eg. Telespar Sign Post by Unistrut Service Company.
- .6 Adhesive: As recommended by sign manufacturer.

### **2.3 FINISHES**

- .1 Chrome/Nickel Plating on Metal Components: To ASTM B456, Type SC 2, Polished finish.
- .2 Galvanized Coating on Steel Components: Hot dipped, zinc alloy coating, to ASTM A123/A123M, Z275 coating designation.
- .3 Galvanized Coating on Steel Hardware: Hot dipped, zinc alloy coating, to ASTM A153/A153M, Class B2.
- .4 Reflective Coating on Metal Components: Clean and degrease metal surface; apply one coat of zinc oxide primer sprayed and baked; two coats of semi-gloss reflective enamel sprayed and baked; symbols and colours as required by authorities having jurisdiction.
- .5 Powder Coating on Metal Components: Electrostatic spray-applied polymer powder coating, minimum 0.05 mm dry film thickness; symbols and colours as required by authorities having jurisdiction.

## **PART 3- EXECUTION**

### **3.1 INSTALLATION**

- .1 Conform to requirements of the authority having jurisdiction.
- .2 Provide routing or mortising as required.
- .3 Bury support stakes minimum 1.0 metre below finished grade.
- .4 Replace Products that are bent, scratched or otherwise damaged.
- .5 Properly install and tighten fasteners to the full required complement.

### **3.2 PROTECTION**

- .1 Refer to Section 01 76 00.
- .2 Protect surfaces with removable protective coverings until Owner occupancy.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Delivery, Storage, and Handling
- .6 2.1 General
- .7 2.2 Corner Guard Protection
- .8 3.1 Installation

### **1.3 SUMMARY**

- .1 Section Includes
  - .1 Corner guards.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Samples:
  - .1 Submit three samples, 300 mm (12") long or 300 x 300 mm (12 x 12") in size as applicable, for each *Product* in specified finish.
- .3 Shop drawings:
  - .1 Submit *Shop Drawings*, and colour and finish samples for work of this Section in accordance with Section 01 33 00 – Submittal Procedures .
  - .2 Clearly indicate fabrication details, plans, elevations, hardware and installation details.
- .4 Templates:
  - .1 The *Contractor* shall ensure that its *Subcontractors* submit templates for use by installers and fabricators as required for proper location and installation of hardware.

### **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 The *Contractor* shall ensure that its *Subcontractors* deliver *Products* to location at the *Place of the Work*.

## **PART 2- PRODUCTS**

## 2.1 GENERAL

- .1 Incorporate reinforcing, fastenings and anchorage required for building-in of *Products*.
- .2 Heights of corner guards are to be full wall heights.
- .3 Where end walls exposed two gypsum board corners *Provide* custom size wrap around corner guards.

## 2.2 CORNER GUARD PROTECTION

- .1 Surface mounted, 90 mm x 90 mm (3.5" x 3.5"), 1.3 mm thick (0.05") (16 gauge) stainless steel angle in accordance with ASTM A276-15(2015), Type 304, AISI No. 4 satin finish, radius edge.
  - .1 Acceptable Products: Type 1 - Construction Specialties Acrovyn Model CO-8
  - .2 Acceptable Products: Type 2 - Construction Specialties Acrovyn Model SCO-8
  - .3 Or *Equivalent*

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- .1 *Install* work to meet manufacturer's recommended specifications, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.
- .2 Clean substrates to remove dirt, debris and loose particles prior to installation.
- .3 Fit joints and junction between components tightly and in true planes.
- .4 *Install* units on solid backing as indicated in the Contract Drawings, and erect with materials and components straight, tight and in alignment.
- .5 Corner guards:
  - .1 Corner guard edges shall be smooth.
  - .2 Mechanically fasten corner guards in accordance with guard manufacturer's written instructions.
  - .3 *Install* corner guard shall be tightly fitted without gaps.
  - .4 Corner Guard Height: Full height.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Delivery, Storage, and Handling
- .6 2.1 Accessories
- .7 2.2 Fabrication
- .8 3.1 Installation
- .9 3.2 Barrier Free Installation Heights
- .10 3.3 Installation of Washroom Accessories
- .11 3.4 Installation Tolerances
- .12 3.5 Adjusting and Cleaning

### **1.3 SUMMARY**

- .1 Section Includes
  - .1 Washroom accessories.
  - .2 Janitor room accessories.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 The *Contractor* shall ensure that its *Subcontractors* submit templates for use by installers and fabricators as required for proper location and installation of hardware.

## 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 The *Contractor* shall ensure that its *Subcontractors* deliver *Products* to location at the *Place of the Work*

## PART 2 - PRODUCTS

### 2.1 ACCESSORIES

- .1 Incorporate reinforcing, fastenings and anchorage required for building-in of *Products*.
- .2 Specified manufacturer's catalogue references are the minimum acceptable standards for work of this Section. Where two manufacturers or *Products* are specified for a given accessory, select one or the other for installation in the *Work*, but not both.
  - .1 Acceptable *Product* manufacturers: Subject to compliance with Contract requirements, *Provide Products* by one of the following:
    - .1 ASI Watrous Inc.
    - .2 Bobrick Washroom Equipment, Inc.
    - .3 Swish Maintenance Ltd.
    - .4 Uline Canada
    - .5 Frost Products Ltd.
    - .6 Or Equivalent
  - .3 Lettering: for identification of accessories and operation instructions shall be silk screened using international symbols unless otherwise specified in the Contract Documents.
  - .4 Washroom Accessory Schedule; locations as indicated or scheduled in the *Contract Documents*. Exact locations determined by the *Consultant*:
    - .1 Stainless steel hat and coat hook:
      - .1 Shall be Bobrick Washroom Equipment of Canada Ltd. B-6827 Hat and Coat Hook or *Equivalent*.
    - .2 Grab bars:
      - .1 Horizontal: 38mm diameter stainless steel grab bars with concealed mounting and peened gripping surface as manufactured by Bobrick Washroom Equipment of Canada Ltd. or *Equivalent*.
      - .2 L-shaped: 38mm diameter stainless steel grab bars with concealed mounting and peened gripping surface as manufactured by Bobrick Washroom Equipment of Canada Ltd. or *Equivalent*. Grab bars to have 900mm long horizontal and vertical components.
      - .3 130 mm diameter stainless steel grab bars with concealed mounting and peened gripping surface, Model B-5806.99x24 as manufactured by Bobrick Washroom Equipment of Canada Ltd. or *Equivalent*.
      - .4 290 degree grab bar, model B-816722.99 as manufactured by Bobrick Washroom Equipment of Canada Ltd. or *Equivalent*.



- .3 Surface-mounted shelves:
  - .1 Surface Mounted Stainless Steel Shelf, model B-295x18, as manufactured by Bobrick Washroom Equipment of Canada Ltd. or *Equivalent*. Refer to the *Drawings* for locations.
- .4 Tilt mirrors: Tilt Mirror with Stainless Steel Frame, 1170 wide and 1170 High, as manufactured by Bobrick Washroom Equipment of Canada Ltd. or *Equivalent*.
- .5 Soap Dispenser: Swish Maintenance Ltd - GOJO FMX12 Foam Dispenser Grey 1250ml or *Equivalent*.
- .6 Towel Dispenser: Swish Maintenance Ltd Hands-Free Roll Tower Dispenser – 772CG or *Equivalent*.
- .7 Toilet Tissue Dispenser: Swish Maintenance Ltd Wagon Wheel 4 Roll Toilet Tissue Dispenser – 884 or *Equivalent*.
- .8 Recessed Soap Holder:
  - .1 Bobrick Washroom Equipment of Canada Ltd. B-4380 Recessed Heavy-Duty Soap Dish or *Equivalent*.
- .9 Recessed Shampoo Holder:
  - .1 Akuaplas LAYLA Shower Niche N1224SS, stainless steel shower niche. 308 x 612 or *Equivalent*.
- .10 Folding shower seat:
  - .1 Bobrick Washroom Equipment of Canada Ltd. B-5191 Folding Shower Seat or *Equivalent*.
- .11 Folding Bench:
  - .1 Bobrick Washroom Equipment of Canada Ltd. B-5181 Reversible Folding Shower seat or *Equivalent*.
- .12 Shower rod and curtain:
  - .1 American Standard 1204-C Rod & 1200-V Curtain or *Equivalent*.
- .13 Waste Receptacle:
  - .1 Wall mounted type; Frost, Model 303-3-NL or *Equivalent*.

## 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.

- .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 in the Contract Documents.

### 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 the *Consultant* before roughing-in.
- .5 *Install* plumb, level, straight, tight and secured, centred between joints on masonry and tile walls.

### 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 the *Consultant*.
- .3 Refinish damaged or defective work, at the *Contractor's* expense, so that no variation in surface appearance is discernible. Refinish work at the *Place of the Work* only if approved by the *Consultant*.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 Part 1 – General
- .2 1.1 General Instructions
- .3 1.2 Section Includes
- .4 1.3 Summary
- .5 1.4 Related Sections
- .6 1.5 Submittals
- .7 1.6 Quality Assurance
- .8 1.7 Delivery, Storage And Handling
- .9 Part 2 Products
- .10 2.1 Manufacturer
- .11 2.2 Turnout Gear Lockers
- .12 2.3 Accessories
- .13 2.4 Finish
- .14 Part 3 Execution
- .15 3.1 Examination
- .16 3.2 Installation

### **1.3 SUMMARY**

- .1 Design, fabrication and installation of wall mounted turnout gear lockers as specified herein.

### **1.4 RELATED SECTIONS**

- .1 Section 10: Metal Lockers
- .2 Sections of Division 16: electrical as applicable.

### **1.5 SUBMITTALS**

- .1 Product Data: Submit manufacturer's product data and installation instructions.
- .2 Shop Drawings: Submit manufacturer's shop drawings for each individual run of lockers.
- .3 Samples: Submit manufacturer's standard color samples.
- .4 Owner's Manual: Provide maintenance manual at closeout.
- .5 Warranty: Submit manufacturer's standard warranty.

### **1.6 QUALITY ASSURANCE**

- .1 Manufacturer shall have a minimum of five years' experience in the direct manufacture of lockers.
- .2 Installer shall have experience in locker installation.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery: Deliver materials to site in manufacturer's original, unopened containers with labels identifying product and manufacturer's name.
- .2 Storage: Store materials in a clean dry area.
- .3 Handling: Protect materials and finish during installation and handling to prevent damage.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURER**

- .1 Mid-Minnesota Wire (GearGrid Product Line), 670 SW 15th Street, Forest Lake, MN 55025. Toll-free 888-643-6694. Phone 651-464-4468. Fax 651-464-4780. Web site [www.geargrid.com](http://www.geargrid.com). Email [sales@geargrid.com](mailto:sales@geargrid.com).

### **2.2 TURNOUT GEAR LOCKERS**

- .1 Model:
  - .1 GEARGRID Wall Mounted Storage System – where indicated on drawings.
  - .2 GEARGRID Tubular Frame Mounted Storage System – where indicated on drawings.
- .2 Locker Sizes:
  - .1 Standard 24" Opening: Overall dimension-79" high x 25.25" wide x 20" deep.
  - .2 Clear Opening Width: 22.75"
- .3 Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.
- .4 Vertical Dividers:
  - .1 Outer Frames: 1.25" O.D. x 16 gauge wall thickness ASTM A513 steel tubing.
  - .2 Inner Grid: .25" diameter ASTM 510 cold drawn steel wire resistance welded to a 3" square pattern.
- .5 E. Back Panel:
  - .1 Grid: .25" diameter ASTM 510 cold drawn steel wire resistance welded to a 3" square pattern.
- .6 Shelves: (1) Top, (1) Bottom. .25" diameter ASTM 510 cold drawn steel wire resistance welded and cold formed. Top shelf includes a 20 gauge steel bracket to accept a 2" x 16" name placard.
- .7 Apparel Hooks: (3) per opening. .25" diameter ASTM 510 cold drawn steel wire resistance welded and cold formed.

### **2.3 ACCESSORIES**

- .1 Horizontal Hang Bar:
  - .1 Tube: 1.25" O.D. x 16 gauge 304 stainless steel tubing.
  - .2 Brackets: Attach to side mesh, powder coated.
- .2 Coat Drying Hanger:

- .1 .25" diameter 304 stainless steel wire cold formed and resistance welded.
- .2 Black vinyl coating on hook end.

## **2.4 FINISH**

- .1 General: All system components excluding assembly and mounting hardware and stainless steel components are to receive the standard finish.
- .2 Standard Finish: Components to be cleaned using a phosphatized bath, clear water rinse and electro-statically coated with a durable TGIC powder coating.
- .3 Color: Red Baron

## **Part 3 – EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine areas to receive lockers. Notify architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

### **3.2 INSTALLATION**

- .1 Install lockers in accordance with manufacturer's instructions.
- .2 Use manufacturer's hardware for assembly.
- .3 Anchor to mounting surface with proper hardware.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

#### **PART 1 – GENERAL**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 RELATED SECTIONS
- 1.5 SUBMITTALS
- 1.6 QUALITY ASSURANCE
- 1.7 DELIVERY, STORAGE AND HANDLING

#### **PART 2 PRODUCTS**

- 2.1 MANUFACTURER
- 2.2 TURNOUT GEAR LOCKERS
- 2.3 ACCESSORIES
- 2.4 FINISH

#### **PART 3 EXECUTION**

- 3.1 EXAMINATION
- 3.2 INSTALLATION

### **1.3 SUMMARY**

- .1 Design, fabrication and installation of wall mounted turnout gear lockers as specified herein.

### **1.4 RELATED SECTIONS**

- .1 Section 10: Metal Lockers
- .2 Sections of Division 16: electrical as applicable.

### **1.5 SUBMITTALS**

- .1 Product Data: Submit manufacturer's product data and installation instructions.
- .2 Shop Drawings: Submit manufacturer's shop drawings for each individual run of lockers.
- .3 Samples: Submit manufacturer's standard color samples.
- .4 Owner's Manual: Provide maintenance manual at closeout.
- .5 Warranty: Submit manufacturer's standard warranty.

### **1.6 QUALITY ASSURANCE**

- .1 Manufacturer shall have a minimum of five years' experience in the direct manufacture of lockers.
- .2 Installer shall have experience in locker installation.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery: Deliver materials to site in manufacturer's original, unopened containers with labels identifying product and manufacturer's name.
- .2 Storage: Store materials in a clean dry area.
- .3 Handling: Protect materials and finish during installation and handling to prevent damage.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURER**

- .1 Mid-Minnesota Wire (GearGrid Product Line), 670 SW 15th Street, Forest Lake, MN 55025. Toll-free 888-643-6694. Phone 651-464-4468. Fax 651-464-4780. Web site [www.geargrid.com](http://www.geargrid.com). Email [sales@geargrid.com](mailto:sales@geargrid.com).

### **2.2 TURNOUT GEAR LOCKERS**

- .1 Model: GEARGRID Wall Mounted Storage System
- .2 Locker Sizes:
  - .1 Standard 20" Opening: Overall dimension-79" high x 21.25" wide x 20" deep.
  - .2 Clear Opening Width: 18.75"
- .3 Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.
- .4 Vertical Dividers:
  - .1 Outer Frames: 1.25" O.D. x 16 gauge wall thickness ASTM A513 steel tubing.
  - .2 Inner Grid: .25" diameter ASTM 510 cold drawn steel wire resistance welded to a 3" square pattern.
- .5 E. Back Panel:
  - .1 Grid: .25" diameter ASTM 510 cold drawn steel wire resistance welded to a 3" square pattern.
- .6 Shelves: (1) Top, (1) Bottom. .25" diameter ASTM 510 cold drawn steel wire resistance welded and cold formed. Top shelf includes a 20 gauge steel bracket to accept a 2" x 16" name placard.
- .7 Apparel Hooks: (3) per opening. .25" diameter ASTM 510 cold drawn steel wire resistance welded and cold formed.

### **2.3 ACCESSORIES**

- .1 Horizontal Hang Bar:
  - .1 Tube: 1.25" O.D. x 16 gauge 304 stainless steel tubing.
  - .2 Brackets: Attach to side mesh, powder coated.
- .2 Coat Drying Hanger:
  - .1 .25" diameter 304 stainless steel wire cold formed and resistance welded.

- .2 Black vinyl coating on hook end.

## **2.4 FINISH**

- .1 General: All system components excluding assembly and mounting hardware and stainless steel components are to receive the standard finish.
- .2 Standard Finish: Components to be cleaned using a phosphatized bath, clear water rinse and electro-statically coated with a durable TGIC powder coating.
- .3 Color: Red Baron

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine areas to receive lockers. Notify architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

### **3.2 INSTALLATION**

- .1 Install lockers in accordance with manufacturer's instructions.
- .2 Use manufacturer's hardware for assembly.
- .3 Anchor to mounting surface with proper hardware.

**END OF SECTION**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 2.1 Materials
- .6 3.1 Installation
- .7 3.2 Installation Tolerances

### **1.3 SUMMARY**

- .1 Section Includes
  - .1 Prefinished metal lockers.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 sloped tops.
- .4 Samples:
  - .1 Submit sample of colour and finish on actual base metal.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Lockers: in accordance with CAN/CGSB 44.40-2001 AMEND.
  - .1 Type: Single tier full-height locker.
  - .2 Size (width x depth x height): 457 mm wide x 610 mm deep x 1830 mm high.
  - .3 Locking system: suitable for padlocks.
  - .4 Metal materials: in accordance with ASTM A1008/A1008M-15, free of imperfections.
  - .5 Frame: 1.6 mm (0.06") thick (16 gauge).

- .6 Door: minimum 2.0 mm (0.07") 20 gauge outer panel and 24 gauge liner, hollow core or honeycomb.
- .7 Shelves: minimum 0.6 mm (0.02") thick (24 gauge)
- .8 Hooks: three single prong coat hooks.
- .9 Coat Rods for each locker
- .10 Jamb Trim: Refer to detail on the *Drawings*. Top trim and side trim.
- .11 Body: minimum 0.6 mm (0.02") thick (24 gauge).
- .12 Filler and end panels: minimum 2.0 mm (0.07") 20 gauge
- .13 Base: manufacturer standard base.
- .14 Number plates shall be inset into the chrome-plated door pull and numbered sequentially, in two sets each starting at "1" for each locker Type as required by the *Consultant*.
- .15 Locker finish; exposed and semi-exposed surfaces: baked on polymer powder or alkyd enamel, custom colour to later selection by the *Consultant*.
- .16 Acceptable manufacturers/*Products*:
  - .1 General Storage Systems Ltd.: 'Decor Tri-Lok'.
  - .2 Hadrian Manufacturing Inc.: 'Emperor Lockers'.
  - .3 Shanahan's Manufacturing: 'Deluxe Lockers'.
  - .4 Or *Equivalent*.

## **PART 3- EXECUTION**

### **3.1 INSTALLATION**

- .1 Assemble and *Install* lockers complete with metal base 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 in the *Contract Documents*.
- .4 *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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Administrative Requirements
- .5 1.5 Submittals
- .6 1.6 Closeout Submittals
- .7 2.1 Manufacturers
- .8 2.2 Materials
- .9 2.3 Aluminum Finishes
- .10 2.4 Fabrication
- .11 3.1 Installation

### **1.3 SUMMARY**

- .1 Section Includes
  - .1 Ground-set flagpoles.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination
  - .1 Coordinate with work of other Sections to ensure satisfactory and expeditious completion of the work of this Section.

### **1.5 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
  - .1 Submit manufacturer's *Product* data sheets for *Products* and equipment proposed for use in the work of this Section.
- .3 *Shop Drawings*:
  - .1 Indicate dimensions, finishes, base jointing, anchoring and support systems, cleats, halyard boxes, trucks, finials and base collar for flagpoles.
- .4 Samples:
  - .1 Submit duplicate samples of each finish specified in the Contract Documents.

## 1.6 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .2 Operation and maintenance data:
  - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

- .1 Ewing Flagpole Co. Inc.
- .2 Or *Equivalent* (substitutions in accordance with Section 01 25 00 – Product Substitution Procedures).

### 2.2 MATERIALS

- .1 Aluminum: Aluminum Association alloy AA 6063-T6 seamless extruded aluminum tubing.
- .2 Flagpole; cone tapered: seamless, uniform, straight line tapered section above cylindrical butt section.
  - .1 Height above mounting base:
    - .1 12192 mm (40'-0")
  - .2 Flagpole, bases and anchorage devices, complete with flag to resist minimum wind gust velocity of:
    - .1 145 km/h (90 ml/h)
  - .3 Acceptable *Product*:
    - .1 Flagpole; Ewing Flagpoles 'SCA40NS' Architectural Series or *Equivalent*.
      - .1 Base: Ewing Flagpoles Co. Inc. 'B5 Fixed' or *Equivalent*.
      - .2 Halyard: Ewing Flagpoles Co. Inc. 'Internal' System' or *Equivalent*.
    - .2 Substitutions: Refer to Section 01 25 00 – Product Substitution Procedures.
  - .4 Finish: Clear anodized in accordance with AA Designation AA-M12C22A31.
- .3 Finial; ball: ball of 1.6 mm (3/5") minimum thick, gold colour, 150 mm (6"), spun from aluminum with watertight seams and mounted to rod fitted to revolving truck.
- .4 Cleats: 230 mm (9") size, 2 per halyard, cast aluminum finish to match flagpole.
- .5 Halyard; internal: stainless steel gearless winch, mounted inside flagpole shaft, accessible by removable locking access door, self-locking winch, lockable at any point operable with a removable crank handle through access hole in shaft. Stainless steel cabling throughout, routed through shaft interior and wound on winch.
- .6 Swivel snaps: two per halyard; aluminum with neoprene or vinyl covers.
- .7 Cleat box: one per cleat; cast aluminum finish to match flagpole. Furnish hasp for padlock, hinged cover, and tamperproof screws. Include lockable cleat box.

- .8 Base cover: spun aluminum base cover, finish to match flagpole.
- .9 Lightning protection:
  - .1 Copper-plated steel with copper wire bolted to flagpole with stainless steel bolt and galvanized steel washer to insulate cable lug from flagpole.
  - .2 Steel ground spike welded to baseplate is an acceptable alternative.

## **2.3 ALUMINUM FINISHES**

- .1 Finish exposed surfaces of aluminum components:
  - .1 Clear anodized in accordance with AA Designation AA-M12C22A31.

## **2.4 FABRICATION**

- .1 *Supply* flagpole as complete unit including mounting brackets anchorage and fittings.
- .2 Fabricate mountings of same metal as flagpoles where exposed and of galvanized steel where concealed.

## **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 and perform as intended.
- .2 *Install* flagpoles, mounting brackets and fittings to reviewed *Shop Drawings* and manufacturer's written instructions.
- .3 Check and adjust installed fittings for smooth operation of halyards.
- .4 *Provide* ground stakes, for positive lightning ground for each ground set flagpole installation.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 RELATED SECTIONS
- 1.5 REFERENCES
- 1.6 SYSTEM REQUIREMENTS
- 1.7 DESIGN REQUIREMENTS
- 1.8 SUBMITTALS
- 1.9 QUALIFICATIONS
- 1.10 REGULATORY REQUIREMENTS
- 1.11 SPECIAL WARRANTY
- 2.1 MANUFACTURER
- 2.2 MANUFACTURED UNITS
- 3.1 EXAMINATION
- 3.2 INSTALLATION
- 3.3 FIELD QUALITY CONTROL
- 3.4 FINAL ADJUSTING AND INSPECTION

### **1.3 SUMMARY**

- .1 Work of this section includes the design, supply, and installation of fall protection equipment including:
  - .1 Roof anchors
  - .2 Horizontal lifeline
  - .3 Preformed metal flashing

### **1.4 RELATED SECTIONS**

- .1 05 21 19 Structural Steel and open Web Steel Joist Framing
- .2 05 31 00 Steel Roof Decking
- .3 07 21 00 Thermal Insulation
- .4 07 52 16 Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing
- .5 07 62 00 Metal Flashing
- .6 07 92 00 Joint Sealants

## 1.5 REFERENCES

- .1 All Products or equipment listed herein to conform to:
  - .1 CAN/CSA-Z91-M02 "Health and Safety Code for Suspended Equipment Operations".
  - .2 CAN/CSA-Z271-98 "Safety Code for Suspended Elevating Platforms"
  - .3 Ontario Occupational Health and Safety Act 859/90 as amended by 523/92, and 213/91 as amended by 631/94 (Construction Projects).
  - .4 CSA G40.21-M1987, M350W and M300W (Structural Quality Steels).
  - .5 CSA W47.1-1983 (Certification of Companies for Fusion Welding of Steel Structures).
  - .6 CSA W59-M1989 (Welded Steel Construction - Metal ARC Welding).
  - .7 CSA G164-M1981 (Hot Dip Galvanizing of Irregularly Shaped Articles).
  - .8 CSA S16.1 "Steel Structures for Buildings".
  - .9 CSA S136 "Design of Steel Structural Members, Light Gauge".
  - .10 CISC 2 "Standard Practice for Steel, Structural, for Buildings".
  - .11 CSA W59 "Welded Steel Construction," and CSA W47 "Certification of Companies for Fusion Welding of Steel Structures".
  - .12 CSA G164 "Galvanizing, Hot Dip, of Irregularly Shaped Articles".
  - .13 CGSB-51-GP 46MP (Manual for Installers of Spray Urethane Foam Thermal Insulation).
  - .14 CUFCA Manual for Installers of Spray Polyurethane Foam Thermal Insulation.

## 1.6 SYSTEM REQUIREMENTS

- .1 Design horizontal lifeline fall protection system to provide for safe execution of window washing or other suspended maintenance operations including travel restraint.
- .2 Co-ordinate work of this Section with 07 52 16 Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing, to provide continuous waterproof protection.

## 1.7 DESIGN REQUIREMENTS

- .1 Design fall protection system to suit building and in accordance with plans, specifications, standards, and regulations/codes contained in sections 1.4 and 1.9.
- .2 Design all anchor components to provide adequate attachment to the building and suited to fall protection system practices. Ensure compatibility with industry standard equipment.
- .3 Ensure all anchor components conform to proper engineering principles and have been designed by a Professional Engineer qualified in the design of fall protection equipment, its application and safety requirements.
- .4 Design anchors to resist without fracture a pull-out force of 5400 lbs (24.03 kN), applied in the most adverse direction.

## **1.8 SUBMITTALS**

- .1 Manufacturer's descriptive literature for each product, including section or other type details.
- .2 Shop drawings and samples in accordance with Section 01 33 00. Shop drawings to show roof layout indicating location and spacing of anchors and horizontal lifeline, including dimensions, detail drawings of securement to structure, design details, and similar data. Drawings to bear stamp of Professional Engineer licensed in the Province of Ontario and upon request, complete with calculations and/or test reports.
- .3 Manufacturer's written installation instructions.
- .4 Upon completion of project, provide Owner with Logbook for mandatory annual inspection.
- .5 Upon completion of project, provide Owner with roof plan showing layout of safety anchor system.
- .6 Shop drawings to include installation and rigging instructions and all necessary Restrictive and Non-Restrictive.

## **1.9 QUALIFICATIONS**

- .1 Manufacturer: Work of this Section to be executed by manufacturer specializing in the design, fabrication and installation of window cleaning/suspended maintenance systems having a minimum of 5 years documented experience.
- .2 Loading and safety assurance: Work of this Section to meet the requirements of governing codes and jurisdiction and to comply with properly engineered loading and safety criteria for the intended use.
- .3 Welding to be executed by certified welders in accordance with CSA W59 and CSA W47.2 requirements.
- .4 Installation to be executed by installers with minimum two years experience installing fall arrest systems.

## **1.10 REGULATORY REQUIREMENTS**

- .1 Comply with the following regulations:
  - .1 Ontario Occupational Health and Safety Act 59/90 as amended by 523/92, and 213/91 as amended by 631/94 (Construction Projects).
  - .2 Ontario Building Code 2006, 4.4.4.1. Anchor Systems on Building Exterior – to be provided where any portion of the roof is more than 8 m (26'-3") above adjacent ground level, for both maintenance and window cleaning operations.
  - .3 CAN/CSA-Z271-98 Safety Code for Suspended Elevating Platforms and CAN/CSA-Z91-02 Health and Safety Code for Suspended Equipment Operations.

## **1.11 SPECIAL WARRANTY**

- .1 Warrant products installed under this section of work to be free of leaks, condensation and defects in materials and/or manufacture, as applicable, for a period of 20 years when installed in accordance with the manufacturer's written instructions.



## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURER**

- .1 Provide products as manufactured by Thaler Metal Industries, 1-800-387-7217 (Mississauga, Ontario, Canada) or 1-800-576-1200 (New Braunfels, TX) or provide equal products by another manufacturer based upon:
  - .1 20 year warranty against leaks, condensation and defects in materials and/or manufacture, as applicable;
  - .2 Ultimate load (structural rating) for up to 5400 lbs (24.03 kN) strength for anchors equipped with forged round eye;
  - .3 Structural integrity backed by \$7,000,000.00 liability insurance;
  - .4 Injection molded urethane insulation to CGSB-51-GP 46MP and ASTM C1029-90, as applicable;
  - .5 air barrier flashing design using EPDM seals only complying with CSA B272-93 flashing standard;
  - .6 maintenance free design;
  - .7 materials and sizes options, and thicknesses;
  - .8 treated flashing deck flange, as applicable;
  - .9 written installation instructions.
- .2 Submission of equal products for review must be in accordance with the requirements of Section 01 25 01.

### **2.2 MANUFACTURED UNITS**

- .1 K-700 Easy Slider Horizontal Lifeline Fall Protection System (Roof Application)
  - .1 Horizontal lifeline system (roof application): Thaler K-700 EASY SLIDER Horizontal Lifeline fall protection system to CSA-Z91-02 and OSHA 1910.66, Subparts D and F with:
    - .1 4-1/2 (114 mm) dia. urethane insulated HSS anchor posts, wall thickness 1/4 (6 mm), hot dipped galvanized ASTM 500, 12 (305 mm) high, welded and bolted to 5/8 x 8 x 8 (16 mm x 203 mm x 203 mm) 44W base plate, securement to suit substrate;
    - .2 Stainless steel fittings (swaged end, energy absorber, double locking carabiner, shuttles, end tensioner, intermediate brackets, corner pieces).
    - .3 304 s.s. cable, 3/8@ (10 mm) dia. 7 x 19 structure); 2 full body harnesses with integral shock absorber (by others);
    - .4 SJ-35 13@ (330 mm) high New-Standard STACK JACK Flashing of .064@ (1.6 mm) mill finish 1100-0T alloy aluminum to CSA B272-93, with EPDM Triple Pressure Grommet Top Seal and EPDM Base Seal and bituminous painted deck flange.
- .2 K-701 Easy Slider Horizontal Lifeline Fall Protection System (Wall Application)
  - .1 Horizontal lifeline system (wall application): Thaler K-701 EASY SLIDER Horizontal Lifeline fall protection system for walls to CSA-Z91-02 and OSHA 1910.66, Subparts D and F with:

- .1 Stainless steel 3/8@ (10 mm) brackets welded to stainless steel base plates 5/8@ x 8@ x 8@ (16 mm x 203 mm x 203 mm), securement to suit substrate;
- .2 Stainless steel fittings (swaged end, energy absorber, double locking carabiner, shuttles, end tensioner, intermediate brackets, corner pieces).
- .3 304 s.s. cable, 3/8@ (10 mm) dia. 7 x 19 structure; 2 full body harnesses with integral shock absorber (by others).

## **PART 3- EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine surfaces and areas upon which the work of this section depends. Report to the Contractor in writing, defects of work prepared by other trades and other unsatisfactory site conditions, which would cause defective installation of products, or cause latent defects in workmanship and function.
- .2 Verify site dimensions.
- .3 For roofs employing tapered insulation systems, height adjustments may be necessary i.e. to ensure centre line of cable anchor bracket is minimum 9" (229 mm) above roof surface.
- .4 Commencement of work will imply acceptance of prepared work.

### **3.2 INSTALLATION**

- .1 Install anchors or equipment in accordance with manufacturer's printed instructions, shop drawings and as specified.
- .2 Ensure anchors or equipment is installed under the direct supervision of a Professional Engineer.
- .3 Where necessary, provide protection against deterioration due to contact of dissimilar materials.
- .4 Where bolting is used for fastening anchors, no fewer than two threads is to be exposed and the nut is to be positively locked by deforming threads, welding, pinning or equivalent method.
- .5 Ensure work is inspected prior to application of roofing.
- .6 Co-ordinate installation with work of related trades.
- .7 Install all work true, level, tightly fitted and flush with adjacent surfaces as required.
- .8 Deform threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal or vandalism.
- .9 Structural steel to receive safety anchors to have adequate bearing surface as indicated on shop drawings and/or to ensure 100% weld.
- .10 If the roof support structure requires reinforcing to take the applied loads of the fall protection systems, this reinforcing will be designed, supplied, engineered and installed by others.
- .11 Flashings
  - .1 Install roof support flashing in accordance with manufacturer's printed instructions.

- .2 Set flashing deck flange in layer of plastic cement and flash in with 3 overlapping layers of felt flashing.
- .3 Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing
  - .1 Torch membrane until bitumen is fluid and set flashing deck flange into fluid. Flash in flange with two overlapping layers of ModBit and seal with asphalt sealer. Do not overheat (melt) EPDM Base Seal.
- .12 Structural adequacy of [roof] [wall] [soffit] or other part of the building on which the support system is placed shall be verified by a professional engineer before installing horizontal lifeline.

### **3.3 FIELD QUALITY CONTROL**

- .1 Comply with the requirements of Section 01 45 00 - Quality Control.
- .2 All anchor work to be inspected by a qualified testing agency, Professional Engineer upon completion of work.

### **3.4 FINAL ADJUSTING AND INSPECTION**

- .1 Verify that all manufactured units have been installed in accordance with specifications and details and will function as intended. Adjust any items where necessary to ensure proper operation.
- .2 Provide necessary documentation certifying system is acceptable for service (Engineer's Certificate of Acceptance).
- .3 Complete "Initial Inspection – Certification for Use" form included in Equipment Manual & Inspection Logbook.
- .4 Adjust and leave equipment in proper working order.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Closeout Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Delivery, Storage, and Handling
- .8 1.8 Extended Warranty
- .9 2.1 Acceptable Manufacturers
- .10 2.2 Hardware – Manual Controlled Shades
- .11 2.3 Assembly
- .12 2.4 Shade Mounting System
- .13 2.5 Aluminum Finish
- .14 2.6 Shade Fabric Types
- .15 2.7 Fabrication
- .16 3.1 Installation
- .17 3.2 Adjusting and Cleaning
- .18 3.3 Closeout Activities

### **1.3 SUMMARY**

- .1 This Section includes:
  - .1 Roller window sunshades at interior locations.
  - .2 Roller window room darkening (black-out) shades at interior locations.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .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 Submit *Shop Drawings* or fully dimensioned catalogue cuts.
  - .2 Window treatment schedule: Use same designations indicated on the *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.

- .4 Samples:

- .1 Submit samples of each material and finish colour selected and each accessory.

## 1.5 CLOSEOUT SUBMITTALS

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.
- .2 Operation and maintenance data:
  - .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

## 1.6 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Manufacturers:
    - .1 The *Contractor* shall select a company specializing in manufacturing the *Products* specified in this Section, with a minimum of 10 years' experience.
  - .2 Installers / applicators / erectors:
    - .1 The 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 one 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.

## 1.7 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.

## 1.8 EXTENDED WARRANTY

- .1 Warrant work of this Section in accordance with Section 01 78 36 – Warranties for a period of two years from the date of Substantial Performance.

## PART 2- PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- .1 Subject to compliance with requirements, *Provide Products* by one of the following manufacturers:
  - .1 MechoShade Systems, Inc.

- .2 Solarfective Products Ltd.
- .3 SunProject Inc.
- .4 Sun Glow
- .5 Or *Equivalent* (substitutions in accordance with Section 01 25 00 – Product Substitution Procedures)

## 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 Factory set for the size and travel of the shades;
    - .3 Capable of being field adjusted from the exterior of the shade unit without having to disassemble the hardware.
    - .4 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. Chain may be positioned at either, or both, ends of the shade without disassembly of the shade unit.
    - .5 *Provide* counter balancing mechanism designed to offset the weight of the shade and give fingertip control.
  - .2 Control shades and room darkening shades independently.

## 2.3 ASSEMBLY

- .1 *Provide* fully factory assembled shade unit consisting of two shade brackets, shade tube, extruded aluminum fascia, hembar 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 molded 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.

## 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: Clear anodized AA-M12C22A31.
- .2 Unexposed aluminum: mill finish.

## 2.6 SHADE FABRIC TYPES

- .1 Sun control fabric; dimensionally stable shade fabric:
  - .1 Acceptable *Products*; 3% open area:
    - .1 Solarfactive 'Solarblock 300 Series' or *Equivalent*.
  - .2 Colour: as selected by the *Consultant* from the manufacturer's full range.
- .2 Room darkening (black-out) fabric; dimensionally stable fabrics:
  - .1 Acceptable *Products*:
    - .1 Solarfactive Products Limited 'SolarStop Blackout Fabric' or *Equivalent*.
  - .2 Colour: as selected by the *Consultant* from the manufacturer's full range.
- .3 Performance: 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.
- .4 Flammability:
  - .1 Certified by an independent Laboratory to pass CAN/ULC S109-03 Large Flame Test.

## 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.
- .2 The fabric shall be colour fast, retain its shape, not be affected by moisture or heat, and shall be non-flammable. Cut fabric to eliminate glare and reflection from shining surfaces while maintaining exterior view. The top of the fabric is retained in recessed spline of the shade roller and the bottom of the fabric is retained by the hem bar.

## 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 (black-out) 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, at the *Contractor's* expense, 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 the *Owner*, to be performed by representative of shade manufacturer to assure proper function, operation and explanation.
  - .2 Conduct comprehensive demonstration for the *Owner's* staff on operation and care of interior window treatments.

**END OF SECTION**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 DEFINITION
- 1.4 SUMMARY
- 1.5 SUBMITTALS
- 1.6 QUALITY ASSURANCE
- 1.7 DELIVERY, STORAGE, AND HANDLING
- 1.8 PROJECT CONDITIONS
- 1.9 WARRANTY
- 1.10 MAINTENANCE
- 2.1 MANUFACTURERS
- 2.2 SOLID SURFACE MATERIAL
- 2.3 ACCESSORIES
- 3.1 EXAMINATION
- 3.2 INSTALLATION
- 3.3 REPAIR
- 3.4 CLEANING AND PROTECTION

### **1.3 DEFINITION**

- .1 Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

### **1.4 SUMMARY**

- .1 *Work* of this section includes solid surface fabrications including, but not limited to, the following:
  - .1 Kitchen countertops and Island countertops
  - .1 Washroom vanities.
  - .2 Windows Sills
  - .3 Worksurfaces
  - .4 Other items noted to be fabricated using SSUR.

### **1.5 SUBMITTALS**

- .1 Submit under provisions of Section 01 3000 - Submittals.
- .2 Product Data:

- .1 Submit product data for each specified product. Include manufacturer's technical data sheets and published instruction instructions.
- .2 Submit Material Safety Data Sheets (MSDS) for adhesives and sealants.
- .3 Shop Drawings:
  - .1 Submit fully dimensioned shop drawings showing countertop and window sill layouts, joinery, terminating conditions, substrate construction, cutouts and holes. Show plumbing installation provisions. Include elevations, section details, and large scale details.
- .4 Samples:
  - .1 Submit selection and verification samples for each color, pattern, and finish required.
- .5 Quality Assurance Submittals:
  - .1 Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.
  - .2 Warranty: Specimen copy of specified warranty.
- .6 Maintenance Data:
  - .1 Submit manufacturer's published maintenance manual with closeout submittals.

## **1.6 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
- .2 Fabricator / installer qualifications:
  - .1 Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
- .3 Applicable standards:
  - .1 Standards of the following, as referenced herein:
    - .1 American National Standards Institute (ANSI)
    - .2 American Society for Testing and Materials (ASTM)
    - .3 National Electrical Manufacturers Association (NEMA)
    - .4 NSF International
  - .2 Fire test response characteristics:
    - .1 Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
      - .1 Flame Spread Index: 25 or less.
      - .2 Smoke Developed Index: 450 or less.
- .4 Coordination drawings:

- .1 Shall be prepared indicating:
  - .1 Plumbing work.
  - .2 Electrical work.
  - .3 Miscellaneous steel for the general work.
  - .4 Indicate location of all walls (rated and non-rated), blocking locations and recessed wall items, etc.
- .2 Content:
  - .1 Project-specific information, drawn accurately to scale.
  - .2 Do not base coordination drawings on reproductions of the contract documents or standard printed data.
  - .3 Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to conflict with submitted equipment and minimum clearance requirements.
  - .4 Provide alternate sketches to designer for resolution of such conflicts.
    - .1 Minor dimension changes and difficult installations will not be considered changes to the contract.
- .5 Drawings shall:
  - .1 Be produced in 1/2-inch scale for all fabricated items.
- .6 Drawings must be complete and submitted to the Consultant within 60 days after award of contract for record only.
  - .1 Coordination drawings are required for the benefit of contractor's fabricators/installers as an aid to coordination of their work so as to eliminate or reduce conflicts that may arise during the installation of their work.
- .7 Job mock-up:
  - .1 Prior to fabrication of architectural millwork, erect sample unit to further verify selections made under sample submittals and to demonstrate the quality of materials and execution.
  - .2 Build mock-up to comply with the contract documents and install in a location as directed by the Design-Builder
  - .3 Notify the architect two weeks in advance of the date of when the mock-up will be delivered.
  - .4 Should mock-up not be approved, re-fabricate and reinstall until approval is secured.
    - .1 Remove rejected units from project site.
  - .5 After approval, the mock-up may become a part of the project
  - .6 This mock-up, once approved, shall serve as a standard for judging quality of all completed units of work.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver no components to project site until areas are ready for installation.

- .2 Store components indoors prior to installation.
- .3 Handle materials to prevent damage to finished surfaces.
  - .1 Provide protective coverings to prevent physical damage or staining following installation for duration of project.

## **1.8 PROJECT CONDITIONS**

- .1 Field Measurements:
  - .1 Verify actual measurements and openings by field measurements before fabrication; show recorded measurements on shop drawings.
  - .2 Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
- .2 Adhesive:
  - .1 Acclimatize adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F

## **1.9 WARRANTY**

- .1 Provide manufacturer's warranty against defects in materials.
  - .1 Warranty shall provide material and labor to repair or replace defective materials.
  - .2 Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
- .2 Warranty period:
  - .1 Two years from date of substantial completion.

## **1.10 MAINTENANCE**

- .1 Provide maintenance requirements as specified by the manufacturer.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- .1 Acceptable Manufacturer:
  - .1 Caesarstone Quartz Surfacing
  - .2 or *Equivalent*.

### **2.2 SOLID SURFACE MATERIAL**

- .1 Acceptable Product:
  - .1 CaesarStone Quartz Surfacing Classico Collection
  - .2 or *Equivalent*.
- .2 Composition: 93% crushed quartz aggregate combined with resins and pigments and fabricated into slabs using a vacuum vibro-compaction process.
- .3 Thickness: as indicated in the *Contract Documents*.

- .4 Colour Group: Whites
- .5 Colour: Caesarstone #2141.
- .6 Finish: Polished.
- .7 Edge Profile: Miter
- .8 Flame Spread Value (FSV): Maximum 25.
- .9 Smoke Developed Value (SDV): Maximum 50.
- .10 Performance Characteristics

PROPERTY	TEST STANDARD	RESULTS
Water Absorption	ASTM C97 & EN-14617-1	≤0.05%
Density	ASTM C97 & EN 14617-1	≥2.1 gr/cm <sup>3</sup>
Flexural Strength	ASTM C880/C880M-15 EN14617-2	> 35 MPa > 40 MPa
Dimensional Stability	EN 14617-12	Class A
Impact Resistance	EN 14617-9	> 4.9L (J)
Compressive Strength	ASTM C170 EN 14617-15	Dry: 219-299 MPa; Wet: 203-274 MPa 157-243 MPa
Abrasion	ASTM C1243-93 EN 14617-4	Volume of chord: V<130 mm <sup>3</sup> Chord length: <25 mm
Freeze-Thaw Resistance	ASTM C1026	No obvious damage after 20 freeze-thaw cycles
Stain Resistance	ANSI Z 124.6	Pass
Chemical Resistance	ANSI Z 124.6 EN 14617-10	Pass Class C4
Linear Thermal Expansion	ASTM 372 EN 14617-11	<52 x 10 <sup>-6</sup> per C
Thermal Conductivity	EN 12664	<1 W/( m K
Thermal Shock	EN 14617-6	No visual defects after 20 cycles %
Boiling Water Resistance	ANSI NEMA LD3-3.5	No effect
High Temperature Resistance	ANSI NEMA LD3-2005	No effect
Surface Burning	ASTM E84	Class A - FSI: 0-25 ; SDI: 0-450
Fire Performance	AS 1530.3:1999	Ignitability Index (0-20): 6-8 Spread of Flame Index (0-10): 0-3 Heat Developed Index (0-10): 2-3 Smoke Developed Index (0-10): 6-7
Fire Classification	EN 13501-1	Wall cladding: B-s1-d0 Flooring and stairs: B-fl-s1

## 2.3 ACCESSORIES

- .1 Mounting Adhesives
  - .1 Provide structural-grade silicone, or epoxy adhesives, as recommended by manufacturer for application and per conditions of use.
  - .2 Acceptable Silicone Manufacturers
    - .1 Dow Corning®
    - .2 GE Sealants and Adhesives
    - .3 Or equivalent

- .3 Acceptable Epoxy Manufacturers
  - .1 Akemi North America
  - .2 Bonstone Materials Corporation
  - .3 Tenax U.S.A.
  - .4 Or equivalent
- .4 Provide spacers, if required, recommended by adhesive manufacturer
- .2 Stone Adhesive
  - .1 Provide epoxy, or polyester adhesive, recommended by manufacturer for application and conditions of use.
  - .2 Acceptable Manufacturers
    - .1 Akemi North America
    - .2 Bonstone Materials Corporation
    - .3 Tenax U.S.A.
    - .4 or equivalent
  - .3 Color: Adhesive that will be visible in finished work should be tinted to match quartz surfacing.
- .3 Joint Sealants
  - .1 Clear silicone sealant, as recommended by manufacturer for application and per conditions of use.
  - .2 Provide anti-bacterial type where required.
  - .3 Acceptable Manufacturers:
    - .1 Dow Corning®
    - .2 GE Sealants and Adhesives
  - .4 Solvent: Product recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives and sealants.
  - .5 Cleaning Agents: Non-abrasive, low pH cleansers.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- .1 Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with manufactures installation guidelines and recommendations.

- .1 Provide product in the largest pieces available.
- .2 Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
  - .1 Exposed joints/seams shall not be allowed.
- .3 3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
- .4 Cut and finish component edges with clean, sharp returns.
- .5 Rout radii and contours to template.
- .6 Anchor securely to base cabinets or other supports.
- .7 Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
- .8 Carefully dress joints smooth, remove surface scratches and clean entire surface.
- .9 Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
  - .1 Coved backsplashes and applied side splashes:
    - .1 Install applied side splashes using manufacturer's standard color- matched silicone sealant.
    - .2 Adhere applied side splashes to countertops using manufacturer's standard color- matched silicone sealant

### **3.3 REPAIR**

- .1 Repair or replace damaged work which cannot be repaired to Consultants satisfaction.

### **3.4 CLEANING AND PROTECTION**

- .1 Keep components clean during installation.
- .2 Remove adhesives, sealants and other stains.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 GENERAL INSTRUCTIONS
- 2.1 EQUIPMENT
- 3.1 INSTALLATION

### **1.3 GENERAL INSTRUCTIONS**

- .1 Contact Information for supply of murphy wallbed hardware equipment:
  - .1 Murphy Wall-beds of Canada
  - .2 Tel: 1-800-670-5505

## **PART 2 - PRODUCTS**

### **2.1 EQUIPMENT**

- .1 Provide eleven (11) of the following items:
  - .1 Murphy Bed Mattress – twin/single - extra long mattress in millwork cabinet.
  - .2 Murphy Bedbox complete with the following:
    - .1 Bedbox Mechanism
    - .2 Powder coated aluminum framing
    - .3 Soft contours with no sharp corners or edges.
    - .4 Cams for panel adjustment.
    - .5 Panel guards.
    - .6 Leg system
    - .7 Proper spring steel for all our springs.
    - .8 Aluminum centre beam,
    - .9 2200 pounds of weight support.

## **PART 3- EXECUTION**

### **3.1 INSTALLATION**

- .1 Install Murphy Beds in accordance with manufacturer's requirements.

**END OF SECTION**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

### **1.2 RELATED WORK**

- |  |                  |
|--|------------------|
| .1 Site Grading                          | Section 31 23 13 |
| .2 Excavation, Trenching and Backfilling | Section 31 23 10 |
| .3 Granular Base                         | Section 32 11 23 |
| .4 Granular Sub-Base                     | Section 32 11 19 |
| .5 Asphalt Paving                        | Section 32 12 16 |

### **1.3 REFERENCES**

- .1 ASTM D4791-10, Test Method for Flat or Elongated Particles in Coarse Aggregate.
- .2 Ontario Provincial Standard Specification 1001.

### **1.4 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00.
- .2 Allow continual sampling by Consultant during production.
- .3 Provide Consultant with access to source and processed material for sampling.
- .4 Install sampling facilities at discharge end of production conveyor, to allow Consultant to obtain representative samples of items being produced. Stop conveyor belt when requested by Consultant to permit full cross section sampling.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following.
  - .1 Natural sand.
  - .2 Manufactured sand.

- .3 Screenings produced in crushing of quarried rock, boulders or gravel.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of the following:
  - .1 Crushed rock.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.

## **2.2 SOURCE QUALITY CONTROL**

- .1 Inform Consultant of proposed source of aggregates and provide access for sampling at least four weeks prior to commencing production.
- .2 If, in opinion of Consultant, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Consultant four weeks in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## **PART 3 – EXECUTION**

### **3.1 PREPARATION**

- .1 Aggregate source preparation
  - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by Consultant.
  - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
  - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
  - .4 When excavation is completed, dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
  - .5 Trim and dress slopes and leave site in neat condition.
- .2 Processing
  - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
  - .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Consultant.
  - .3 Wash aggregates to meet specifications. Use only approved equipment.
  - .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

.3 Handling

- .1 Handle aggregates to avoid segregation, contamination and degradation.

.4 Stockpiling

- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Consultant. Do not stockpile on completed surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Consultant within 48 h of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
  - .1 Max. 1.5 m for coarse aggregate and base course materials.
  - .2 Max. 1.5 m for fine aggregate and sub-base materials.
  - .3 Max. 1.5 m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

**3.2 CLEANING**

- .1 Leave aggregate stockpile site in tidy, well drained conditions, free of standing surface water.
- .2 Leave any unused aggregates in neat stockpiles as directed by Consultant.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Definitions
- .4 1.4 Protection
- .5 1.5 Public Safety
- .6 3.1 Preparation
- .7 3.2 Grubbing
- .8 3.3 Removal and Disposal
- .9 3.4 Finished Surfaces

### **1.3 DEFINITIONS**

- .1 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.
- .2 Grubbing consists of excavation and disposal of stumps and roots, boulders and rock fragments, to not less than a specified depth below existing ground surface.

### **1.4 PROTECTION**

- .1 Prevent damage to landscaping, buildings, pavements, and root systems of trees which are to remain. Repair any damaged items as directed by Consultant.
- .2 Replace any trees designated to remain, if damaged, as directed by Consultant.

### **1.5 PUBLIC SAFETY**

- .1 Erect barricades to the approval of the Consultant such that all work of this section shall occur totally within areas not accessible to the public.

## **PART 2 – PRODUCTS**

Section not used.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- .1 Inspect site and verify with consultant trees designated for removal and trees to remain.
- .2 Locate and protect all utility lines. Preserve in operating condition active utilities traversing site.
- .3 Drawings showing utilities cannot be guaranteed as to accuracy or completeness.
- .4 Notify utility companies and arrange for necessary stake outs and approvals before starting tree removal.
- .5 Ensure that all permits necessary to undertake the work are in place.

### **3.2 GRUBBING**

- .1 Grub out stumps and roots to not less than 500 mm below ground surface.
- .2 Grub out visible rock fragments and boulders, greater than 50 mm in greatest dimension.

### **3.3 REMOVAL AND DISPOSAL**

- .1 Remove felled and grubbed materials off site to the approval of the Consultant.
- .2 Felled timber becomes the property of the Contractor.

### **3.4 FINISHED SURFACES**

- .1 Leave ground surface in condition suitable for stripping of topsoil and other stipulated operations.

**END OF SECTION**

**PART 1 – GENERAL****1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

**1.2 RELATED WORK**

- |                        |                  |
|------------------------|------------------|
| .1 Site Grading        | Section 31 23 13 |
| .2 Water System        | Section 33 11 17 |
| .3 Storm Sewers        | Section 33 44 00 |
| .4 Aggregates: General | Section 31 05 17 |

**1.3 DEFINITIONS**

- .1 Common excavation: excavation of materials of whatever nature, including dense tills, hardpan, frozen materials and partially cemented materials which can be ripped and excavated with heavy hydraulic excavating equipment.
- .2 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .3 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .4 Borrow material: Sub-soil material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work. This material shall be of residential/agricultural origin and shall meet or exceed the confined fill material criteria as per MOE "Fill Quality Guidelines for Lake Filling in Ontario" of June 1992. Contractor shall provide consultant with one chemical test per source prior to hauling material to the site.
- .5 Unsuitable materials:
  - .1 Weak and compressible materials under excavated areas.
  - .2 Frost susceptible materials under excavated areas.
  - .3 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1
    - .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.
- .6 Un-shrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

## 1.4 SAMPLES

- .1 Submit samples of bedding or other granular backfill materials in accordance with Section 01 33 00.
- .2 Inform Consultant prior to commencing work, of proposed source of fill materials and provide access for sampling.

## 1.5 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities and structures:
  - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .2 Prior to commencing excavation work, notify Consultant or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Consultant or authorities having jurisdiction shall clearly mark such locations to prevent disturbance during work.
  - .3 Confirm locations of buried utilities by careful test excavations.
  - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered. Obtain direction of Consultant before moving or otherwise disturbing utilities or structures.
  - .5 Record location of maintained, re-routed and abandoned underground lines.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

- .1 Granular Base: to Section 32 11 23.
- .2 Granular Sub-Base: to Section 32 11 19.
- .3 Fill concrete: to Section 03 30 00 and following requirements:
  - .1 Minimum compressive strength at 28 days: 15 MPa.
  - .2 Maximum slump at time and point of discharge: 100 mm.
- .4 Unshrinkable fill: to the following requirements.
  - .1 Maximum compression strength at 28 days: 0.4 MPa.
  - .2 Maximum cement content: 25 kg/m<sup>3</sup> of concrete mix.
  - .3 Slump at time and point of discharge: 150 to 200 mm.
  - .4 Air content: 4 to 6%
- .5 Sewer pipe embedment shall be mortar sand conforming to OPSS 1004 Granular D extending 150mm or ¼ of the pipe diameter, whichever is greater, around all sides of pipe.
- .6 Granular Backfill: Imported granular material conforming to a Granular 'B' Type I, as specified in OPSS 1010, or approved reclaimed granular materials free of organics.

.7 Borrow material: See Part 1 – General, Definitions.



**PART 3 – EXECUTION****3.1 ALL TRENCHING, BACKFILLING AND COMPACTING IS TO BE COMPLETED IN ACCORDANCE WITH OPSS 514.****3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

**3.3 STOCKPILING**

- .1 Stockpile fill materials in areas designated by Consultant. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

**3.4 DEWATERING**

- .1 Keep excavations free of water while work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 Dispose of water in a manner not detrimental to public and private property, or any portion of work completed or under construction.
- .4 Continuously dewater the excavations to control surface runoff or perched water table seepage for concreting and other work to be carried out in the dry condition.
- .5 Discharging into a geotextile bag should be placed on a relatively flat surface and at least 30m away from any natural water feature.
- .6 Submit for Consultant's review details of proposed dewatering methods, such as dikes or well points.

**3.5 TRENCH EXCAVATION**

- .1 Excavate to lines, grades, locations, elevations and dimensions as indicated or directed by Consultant.
- .2 Remove excavated material and other obstructions encountered during excavation. Excavated trench material may be used as fill material on-site provided it is free from deleterious materials.
- .3 Excavation must not interfere with normal 45° splay of bearing from bottom of any footing.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 Unless otherwise authorized by Consultant 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.

- .6 Do not obstruct flow of surface drainage or natural watercourses.

- .7 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .8 Notify Consultant when bottom of trench excavation is reached.
- .9 Obtain Consultant approval of completed excavation.
- .10 Remove unsuitable material from trench bottom to extent and depth as directed by Consultant.
- .11 Correct unauthorized over-excavation as follows:
  - .1 Fill under bearing surfaces and footings with concrete specified for footings.
  - .2 Fill under other areas with Granular 'B' material specified in Section 32 11 19.
- .12 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Consultant.

### **3.6 SURPLUS EXCAVATED MATERIAL AND REMOVALS**

- .1 The Contractor is to make his own arrangements for the disposal of all excavated materials, removals, grindings and all other debris not suitable for re-use in the construction. If the Contractor enters into an agreement with an individual for the use of land for the disposal of excavated materials or for any other reason, a copy of the said Agreement clearly stating the obligation of all concerned and signed by all parties shall be submitted to the Consultant. The Contractor shall comply with the requirements of all Federal, Provincial and Municipal Laws, Acts, Ordinances, Regulations, Orders-in-Council and By-Laws, which could in any way pertain to the work outlined in the Contract. The items in the Form of Tender include all costs for disposal of unsuitable or excess material off the site and the Contractor shall make the arrangements for the disposal of the materials removed in accordance with MOE Reg. 558.

### **3.7 BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified.
- .2 Place bedding and surround material in unfrozen condition.

### **3.8 BACKFILLING**

- .1 Do not proceed with backfilling operations until Consultant has inspected and approved installation.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Trench backfill is to consist of Granular B Type I as specified in OPSS 1010 or reclaimed granular materials free of organics.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer to 98% SPMDD.
- .5 Backfill around installations.
  - .1 Place bedding and surround material as specified elsewhere.

- .2 Do not backfill around or over cast-in-place concrete within 24 hr. after placing of concrete.

- .3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 0.3 m.
- .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 Consultant or;
  - .2 If approved by Consultant, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Consultant.
- .6 Backfill within municipal right of way:
  - .1 Trench backfill for the storm, sanitary and water servicing connections to municipal servicing shall be un-shrinkable fill.

### **3.9 INSPECTION AND TESTING**

- .1 Testing of materials and compaction will be carried out by testing laboratory designated by Consultant. Frequency of tests will be determined by Consultant.
- .2 The Owner will pay costs for inspection and testing.

### **3.10 RESTORATION**

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Consultant. Any disturbed grassed areas are to be restored to original condition or better with 150 mm depth of topsoil, and sod. Damaged concrete or asphalt areas are to be restored to original condition or better. Repaired asphalt areas are to be matched with adjacent asphalt and include a lab joint as per the drawing detail provided.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

### **1.2 DESCRIPTION**

- .1 Provide all labour, materials, tools and equipment necessary for all excavation and backfill to the full extent of work shown on the plans and this specification, including but not limited to the following:
  - .1 Grading (cutting and filling) to subgrade elevations including compaction and fine grading of existing earth materials to +/- 25 mm of design subgrade elevations (not uniformly high or low) in accordance with OPSS 206.
  - .2 Proof rolling of subgrade with Geotechnical consultant present
  - .3 Excavation and disposal of all excess unsuitable materials off site.
  - .4 Supply and installation of earth borrow material as required to establish design subgrade elevations.

### **1.3 RELATED WORK**

- .1 Excavating, Trenching and Backfilling Section 31 23 10
- .2 Aggregates: General Section 31 05 17

### **1.4 SITE CONDITIONS**

- .1 Protection:
  - .1 Provide protection (i.e. shoring, cribbing, bracing and planking) to ensure no damage occurs to existing facilities and equipment situated on site. In certain areas only hand tools may be used.
  - .2 Provide adequate protection around bench marks, layout markers, survey markers, and geodetic monuments.
  - .3 Protect bottom of excavations from freezing.
  - .4 Protect bottoms of excavations from softening. Should softening occur, remove softened soil and replace with lean concrete. Keep bottoms of excavations dry at all times.
  - .5 Direct discharge from pumps, when draining excavations, so that damage to site and adjacent property does not occur.
  - .6 Do not stockpile excavated material to interfere with site operation or drainage.
  - .7 Effect approved measures to minimize dust as a result of all grading work and all other construction activities related to this contract.

- .8 Protect legal iron bars, bench marks, surface or underground utility lines which are to remain. If damaged, restore to original or better condition unless directed otherwise.
- .9 Ensure sufficient quantities of wood sheeting, timbers, steel members and other materials are available at all times in order to support, brace or protect utilities, structure and properties near to or occurring within excavations.
- .2 The Contractor shall take all the necessary precautions to protect all utilities against damage. The Contractor shall carry out his work in a safe manner with due regard for roadway traffic to the satisfaction of the Consultant, and any authority having jurisdiction.
- .3 The Contractor shall have full and sole responsibility for the safety of all excavation performed under this Contract until final acceptance of the work.
- .4 Utility Lines:
  - .1 Before beginning work, establish location and extent of underground utility lines in area of excavation. Notify Consultant of all existing located services encountered, and do not continue with excavation without the Consultant's instructions. Repair and pay for damages to existing utility lines resulting from the work.
  - .2 Relocate existing lines in area of excavation which must remain active as indicated on the drawings.
  - .3 Remove abandoned utility lines, if any, to distance of 2 m from foundations. Cap lines at cut-off points.
  - .4 Record locations, if any, of maintained, re-routed and abandoned underground utility lines.
  - .5 Repair and pay for damage to existing underground lines as may result from this work.
- .5 Examination:
  - .1 Ensure in examination of the site that all possible factors concerning earthwork are investigated, and that the following are known in particular:
    - .1 Methods and means available for material handling, disposal, storage, and transportation.
    - .2 Physical conditions of site, including ground water table and drainage course, extent of removals and grading completed under a previous contract (demolition and site demolition).
  - .2 Unsatisfactory Soil Conditions:
  - .3 Any unsatisfactory or questionable soil conditions revealed during excavation shall be reported immediately to the Owner's Consultant and Geotechnical Engineer.
  - .4 All foundation and sub-structural work shall cease until the condition has been examined and approval to proceed has been issued.
- .6 Material Unsuitable for Backfill:
  - .1 The Contractor shall be responsible for all costs associated with the excavation and removal, off site, of all materials unsuitable for backfill or re-use.
- .7 Water:

- .1 Keep excavation free from water at all times. Provide drainage trenches and sumps as necessary and pump water well away from excavation. Do not discharge water onto private property.
- .8 Inspection and Testing:
  - .1 Testing of materials and compaction will be carried out by testing laboratory designated by the Consultant.

## **1.5 ENVIRONMENTAL REQUIREMENTS**

- .1 Protect and repair exposed excavations where required to prevent adverse effects of rain, freezing weather and other weather conditions on subgrade of subsequent work.
- .2 Suspend construction operation at times when satisfactory results cannot be obtained on account of rain, snow, freezing weather or other unsatisfactory conditions.
- .3 Do not carry out filling or backfilling in freezing weather unless authorized by Consultant. Do not use frozen material nor place material where the material in place is already frozen.
- .4 Dispose of excess or unsuitable earth materials generated from the site grading in accordance with Ontario Reg. 558. The items in the Form of Tender include all costs for disposal of excess or unsuitable material off the site and the Contractor shall make the arrangements for the disposal of the materials removed in accordance with MOE Reg. 558.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Earth Borrow
  - .1 Earth borrow shall be earth material obtained from outside the project limits that meets the requirements of Ontario Provincial Standard Specification (OPSS) MUNI 212.
- .2 Backfill
  - .1 Site or imported material containing no organic or foreign matter, and which the subcontractor can demonstrate is compactable to a density of 98% SPMDD.

### **2.2 STOCKPILING**

- .1 Fill Materials
  - .1 Temporarily Stockpile fill materials in areas designated by Owner. Stockpile granular materials to prevent segregation.
- .2 Protection
  - .1 Protect fill materials from contamination and freezing.

## **PART 3 – EXECUTION**

### **3.1 STRIPPING OF TOPSOIL**

- .1 Do stripping of topsoil in accordance with this Section and Geotechnical Consultant requirements.



- .2 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Consultant.
- .3 Commence topsoil stripping of areas as indicated after area has been cleared of brush, weeds and grasses and removed from site.
- .4 Strip all topsoil. Avoid mixing topsoil with subsoil.
- .5 Stockpile sufficient topsoil for restoration of all grassed areas impacted by the construction.
- .6 Remove and dispose of surplus topsoil, off site.
- .7 All silt fence and erosion control measures to be in place before start of topsoil stripping operation.

### **3.2 EXCAVATION/GRADING**

- .1 Grade to subgrade levels (to a tolerance +/- 25 mm but not consistently high or low) allowing for surface treatment as indicated.
- .2 Do not place material which is frozen nor place material on frozen surfaces.
- .3 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .4 Excavation, placing and compacting of fill materials are to be carried out in accordance with Ontario Provincial Standard Specification (OPSS) MUNI 206.
- .5 Do not disturb soil within branch spread of trees or shrubs to remain.
- .6 If any soft areas are detected during the proof rolling process, and with the Consultant's direction, sub-excavate as per Geotechnical Consultant's recommendations. Sub-excavated areas are to be backfilled with suitable native material, or imported approved granular material.

### **3.3 PROOF ROLLING**

- .1 Proof rolling shall be carried out on completed subgrade prior to installing granular sub-base materials.
- .2 Proof rolling shall be carried out using a roller with a minimum static weight of 5 tonnes, and shall consist of a minimum of four passes per unit area. Wet areas or deleterious materials identified during proof rolling shall be sub-excavated and be replaced with engineered fill, consisting of Granular B, Type I as per OPSS PROV 1010 or select native material, compacted to 98% SPMDD in maximum 200 mm lifts.

### **3.4 FIELD QUALITY CONTROL**

- .1 Inspection and testing of materials and compaction will be carried out by the Geotechnical Consultant engaged by the Owner for this project. Costs of tests will be paid by Owner.
- .2 Sieve Analysis
  - .1 Proposed fill materials will be tested to confirm suitability for intended use and conformity with specifications.

.3 Reinstatement

- .1 All disturbed areas must be reinstated to Consultant's and Owner's satisfaction.
- .2 Any damage to the existing rail right-of-way, due to the Contractor's operations, shall be made good at the Contractor's expense.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work.

### **1.2 RELATED WORK**

- .1 Aggregates Section 31 05 17

### **1.3 REFERENCES**

- .1 ASTM D4791-10, Test Method for Flat or Elongated Particles in Coarse Aggregate.
- .2 Ontario Provincial Standard Specification 1001.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Geotextile for siltation control fence shall be Class I non-woven geotextile fabric in accordance with OPSS PROV 1860.

### **2.2 SOURCE QUALITY CONTROL**

- .1 Inform Consultant of proposed source of aggregates and provide access for sampling at least four weeks prior to commencing production.
- .2 If, in opinion of Consultant, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Consultant four weeks in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- .1 Silt Control Fence
  - .1 Install silt control fence along construction site perimeter including tee bars, geotextile filter fabric, clear stone along the upstream side of the fence in the instance the ground is frozen.
- .2 Heavy Duty Tree Hoarding

- .1 Install tree hoarding extending 1800mm MIN from dripline in accordance with DWG. ULA 110A

### **3.2 MAINTENANCE**

- .1 Maintain silt control fencing and tree hoarding for the duration of the construction and replace as required until the site is stabilized.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 SUBMITTALS
- 1.5 QUALITY ASSURANCE
- 2.1 MATERIALS
- 3.1 GEOTEXTILE FILTER CLOTH MEMBRANE ON SUBGRADE
- 3.2 PROTECTION

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Geotextiles.

### **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.

### **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 approval and training of *Product* manufacturers.

## **PART 2- PRODUCTS**

### **2.1 MATERIALS**

- .1 Geotextile filter cloth:
  - .1 Non-woven geotextile of polypropylene or polyester fibres, or combination of both.
  - .2 Permeability: 2.0 x 10<sup>-1</sup> 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 E.O.S.: 75 to 150 um.
  - .6 Acceptable Products:

- .1 'Terrafix 270R' by Terrafix Geosynthetics Inc.
- .2 'Mirafi P-150' by Mirafi Construction Products.
- .3 'Tytar 3341' by Tytar Geotextiles, or
- .4 Or equivalent.

## **PART 3- EXECUTION**

### **3.1 GEOTEXTILE FILTER CLOTH MEMBRANE ON SUBGRADE**

- .1 Do not cover final prepared subgrade surface until completion of quality control inspection.
- .2 Entire subgrade surface shall be covered with geotextile filter cloth membrane.
- .3 Install filter cloth in accordance with filter cloth manufacturer's written instructions.
- .4 Geotextile filter cloth shall be placed directly on the prepared subgrade and shall be in complete intimate contact with the prepared surface. Bridging of small hollows will not be permitted.
- .5 Place geotextile filter cloth on sloping surfaces in one continuous length.
- .6 Overlap filter cloth joints minimum 300 mm (12").
- .7 Secure and protect filter cloth against displacement.
- .8 After installation, cover with overlying layer within 4 hours of placement.
- .9 Replace damaged or deteriorated geotextile to approval of the *Consultant*.

### **3.2 PROTECTION**

- .1 Do not permit construction equipment on installed geotextiles.

**END OF SECTION**

## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Requirements
- .2 1.2 Section Includes
- .3 1.3 Background
- .4 1.4 General Scope Of Services
- .5 1.5 Qualifications Requirements
- .6 1.6 Permits / Licenses
- .7 1.7 Equipment
- .8 1.8 Priority
- .9 1.9 Hours Of Work
- .10 1.10 Material Safety Data Sheet (M.S.D.S.) Forms
- .11 1.11 Maintenance Period
- .12 1.12 Quality Assurance
- .13 1.13 Safety Precautions
- .14 1.14 Uniforms And Conduct Of The Contractor
- .15 1.15 Contractors Schedule Meetings
- .16 1.16 Review And Inspection
- .17 1.17 Maintenance Log Requirements
- .18 1.18 Delivery, Storage And Handling
- .19 1.19 Damage To Property
- .20 1.20 Protection And Cleanup
- .21 1.21 Final Acceptance And Termination Of Maintenance
- .22 1.22 Maintenance Instructions
- .23 3.1 General Workmanship
- .24 3.2 Spring Clean-Up
- .25 3.3 Watering – Turf Areas
- .26 3.4 Topdressing And Reseeding
- .27 3.5 Sod Replacement
- .28 3.6 Turf Establishment And Erosion
- .29 3.7 Fertilizing
- .30 3.8 Mowing - Maintained Areas
- .31 3.9 Trimming: Trim Grass Areas As Follows:
- .32 3.10 Turf Aeration
- .33 3.11 Turf Dethatching
- .34 3.12 Tree And Shrub Maintenance

- .35 3.13 Plant Removal And Replacement
- .36 3.14 Integrated Pest Management
- .37 3.15 Pests: Weed, Insect And Disease Control
- .38 3.16 Autumn Preparation
- .39 3.17 Cleanliness Of Grounds

### **1.3 BACKGROUND**

- .1 The Regional Municipality of York ("York Region") is in the heart of the Greater Toronto Area (GTA) in Southern Ontario and is the only GTA Owner without direct access to Lake Ontario. York Owner is composed of nine area municipalities covering 1,756 square kilometres (678 square miles), stretching from the City of Toronto in the south to Lake Simcoe and the Holland Marsh in the north, and bounded by the Regional Municipality of Peel ("Peel Owner") in the west and the Regional Municipality of Durham ("Durham Region") in the east. The dominant physical features of the Owner are Lake Simcoe and the Oak Ridges Moraine, an east-west rolling topography, including forested areas, wetlands, and kettle lakes covering 500 square kilometers or 193 square miles. These features enhance the quality of life for the Owner's residents, provide abundant recreational opportunities, and are a basis for tourism in the Owner. In 2016, York Region's population grew by 20,500 people from 2015, increasing an estimated 1.8 per cent to 1,186,900. One goal of York Region's Official Plan is the promotion of sustainable natural environments. It states— "To conserve and improve the natural environment for this and future generations so that it will sustain life, maintain health and provide an improved quality of life." This coincides with the Health Services Mission Statement *"Working together to promote, protect and enhance the health and safety of the people of York Region."*

### **1.4 GENERAL SCOPE OF SERVICES**

- .1 Qualified commercial landscaping contractors for Summer Grounds Maintenance.
- .2 The qualified Contractor shall have the appropriate experience, relevant affiliations, licenses and accreditations to perform the Work in accordance with this section.
- .3 The Contractor shall supply all equipment, materials and labour as necessary to carry out the Work.

### **1.5 QUALIFICATIONS REQUIREMENTS**

- .1 Contractors shall have no less than 3 years' experience in Summer Grounds Maintenance Operations.

### **1.6 PERMITS / LICENSES**

- .1 The Contractor shall possess all permits and licenses as necessary to operate the equipment and carry out the Work as required under the Contract, including the application of pesticides (Land Class 1 and 3 and operator's license).

### **1.7 EQUIPMENT**

- .1 The Contractor shall supply all equipment necessary to perform the Work as outlined in this specification section and to the Work to the satisfaction of the Owner. All equipment shall be of an industrial/commercial type for the purpose of summer grounds maintenance and shall be in good working condition. The Owner will not consider equipment, which does not meet the above



specifications, and shall require the Contractor to furnish equipment that meets the specifications prior to the commencement of the Work.

- .2 The Contractor shall specify on the equipment list the various types of equipment that it agrees to use in performance of the Work. All equipment shall be reliable and in good working order in accordance with the manufacturer's recommendations so as not to delay or hinder the performance of the Work. Equipment used shall be suitable for the purpose intended.
- .3 All safety devices must be in place and activated by the Contractor during the performance of the Work.
- .4 To perform the Work for grounds maintenance, it is expected that a combination of the equipment listed below will be required for the Work, they may include but are not limited to:
  - .1 All equipment shall be outfitted with a Blue Warning Light on an assembly rotating in a horizontal plane, or a strobe type;
  - .2 A roll bar and, or cage is required on tractors. Operators shall be restrained by way of seat belt;
  - .3 Commercial grade grass cutting equipment, suitable for the site for which it will be used;
  - .4 All wheel drive Rotary Mower, 11 to 16 feet wide; and
  - .5 Commercial grade grass trimmers.
- .5 Contractors shall ensure that all staff adheres to safe work practices and that all necessary safety equipment is used by employees while on the job site.
- .6 The Contractor shall comply with all requests made by the Owner's Health and Safety Officer and shall be in compliance with the Ontario Health and Safety Act.

#### **1.8 PRIORITY**

- .1 The Contractor is required to treat the Owner as a high priority customer and the Contractor shall utilize its resources to ensure a continuous upkeep of the Place of Work.

#### **1.9 HOURS OF WORK**

- .1 Perform maintenance work during regular working hours of 07:00 to 18:00, Monday to Friday unless directed otherwise by the Owner.
- .2 Obtain Owners approval to perform maintenance outside of regular working hours.

#### **1.10 MATERIAL SAFETY DATA SHEET (M.S.D.S.) FORMS**

- .1 The Contractor shall provide material safety data sheets for all chemicals used to the Owner prior to the commencement of any Work.

#### **1.11 MAINTENANCE PERIOD**

- .1 Maintain exterior landscape work for the duration of the Warranty Period of the Contract after the date of Substantial Performance.
- .2 Maintenance services shall be performed on a one day-a-week basis during the landscape growing season from April 15 through to October 31st. Owner reserves the right to determine actual date of commencement and termination of maintenance based on existing climatic conditions, soil moisture and plant health.

- .3 Any additional maintenance beyond the specified maintenance and warranty period required for Contractor to achieve final acceptance shall be provided at Contractor's own expense.
- .4 Any incomplete weeks or months of maintenance shall be carried over to the following landscape growing season.
- .5 Owner reserves the right to extend maintenance period and/or reduce monthly progress payments for maintenance services any time Contractor neglects to provide adequate maintenance services in accordance with contract specifications as determined by the Owner.

#### **1.12 QUALITY ASSURANCE**

- .1 Site Supervisor: competent, experienced, and knowledgeable to direct and supervise all staff and maintenance work of contract. Supervisor shall possess a Landscape Journeyman Gardner certification or other similar qualification acceptable to Owner. Submit supervisor's credentials for Owner's approval prior to commencement of work.
- .2 Weekly Site Visits: provide adequate site visits each week with sufficient staff to ensure that all required maintenance services are performed and completed on schedule in accordance with specifications.
- .3 Site Security: Contractor's personnel shall carry personal identification at all times while on site. Identification shall be presented when requested by Owner or other site security staff. All employees must check in with Owner upon entering and leaving the premises where applicable.
- .4 Employee Attire/Safety Vests: all workers shall be properly attired at all times. Each employee working on site shall wear a reflective brightly coloured safety vest for safety and visibility.
- .5 Submittals: submit all required information and documents for Owners approval where specified in contract documents and applicable to work of contract and as requested by the Owner.

#### **1.13 SAFETY PRECAUTIONS**

- .1 Contractor shall supply and ensure that all workers use appropriate personal protective equipment as required by Ontario's Occupational Health and Safety Act, Regulations and Code.
- .2 Contractor shall provide training and ensure all workers practice appropriate safety measures and safe use of tools and equipment in accordance with WHMIS (Workplace Hazardous Materials Information System).
- .3 The Contractor shall ensure that all workers wear Canadian Standard Association (CSA) approved green patch safety footwear, safety glasses and fluorescent yellow or orange safety vests and all necessary safety equipment and clothing, where applicable, during the performance of any Service under the Contract.
- .4 Provide a description of your dispatch set up and the process for communicating the needs of the client to your personnel, employed to provide the Services under this Contract.
- .5 Owner reserves the right to have the Contractor remove any employee from site if not wearing personal protective equipment or if not practicing safe work procedures.
- .6 Regulatory Requirements: perform work in accordance with all applicable laws, codes and regulations required by authorities having jurisdiction over such work and provide all permits required by local authorities.

#### **1.14 UNIFORMS AND CONDUCT OF THE CONTRACTOR**

- .1 The Contractor shall maintain an appropriate and respectful level of conduct in dealing with Owners Staff and the general public while in performance of their duties under the Contract. All staff of the Contractor and any subcontractors shall be identified by way of company uniform appropriate to the working conditions.

#### **1.15 CONTRACTORS SCHEDULE MEETINGS**

- .1 Prior to the commencement of the Work, the Contractor shall meet with the Region (or its designate) to establish a Service schedule acceptable to the Region. The Contractor shall meet with the Region (or its designate) on a monthly basis thereafter for the term of the Contract and any extensions thereof to ensure that the requirements of the Contract are being fulfilled. Contractor's workmanship and performance will be reviewed, and other landscape concerns or issues addressed and evaluated.

#### **1.16 REVIEW AND INSPECTION**

- .1 The Work provided by the Contractor will be reviewed by the Owner and must be carried out to the satisfaction of the Owner.
- .2 Owner shall, at their sole direction, conduct random site inspections throughout the maintenance period to evaluate work performed. Contractor shall promptly correct all deficient work within three days of the Owners notification.
- .3 Although the provision of the Work is the sole responsibility of the Contractor, the Owner reserves the right to monitor the performance of the Contractor and to issue directives to the Contractor to remedy any condition which the Owner considers to be detrimental to provision of the Work. The Contractor shall be required to carry out the terms of such directives immediately after notice in writing from the Owner or within a mutually agreeable timeframe

#### **1.17 MAINTENANCE LOG REQUIREMENTS**

- .1 Maintain and complete a maintenance log for each day of maintenance activity throughout maintenance period.
- .2 Submit maintenance log data to the Region each week for verification and approval of services performed. Contractor shall ensure maintenance log data is true and accurate. Site supervisor must complete and sign maintenance log.
- .3 Record all maintenance activities including date/time of activities, quantity of water supplied and applied on site, materials used and quantity during maintenance of landscape installations, location where activities were carried out, number of employees and name of supervisor on site.

#### **1.18 DELIVERY, STORAGE AND HANDLING**

- .1 Remove all equipment and materials off site after each maintenance day.
- .2 Store tools, equipment, and materials in a secure area when not in use during period of operation and at the completion of each scheduled task.
- .3 Contractor shall be present on site to accept delivery of all equipment and/or material shipments.

#### **1.19 DAMAGE TO PROPERTY**

- .1 Contractor shall be held directly responsible for all damages to Region's property, the personal property of all employees, staff and visitors and the property of adjacent land owners resulting

from the actions of the Contractor, the Contractor's employees, subcontractors or representatives who provide service under this contract.

- .2 Contractor shall immediately report all damages to the Region.
- .3 Repair, replace or restore all damaged property to its original condition or better as directed by the Region. Damages shall be promptly corrected within seven days of approval unless directed otherwise by the Region.
- .4 Scalping of turf, mechanical damage or injury to plant material, improper plant pruning, and damages resulting from improper use of chemical pesticides and fertilizers will be considered property damage.

#### **1.20 PROTECTION AND CLEANUP**

- .1 The Contractor shall provide, erect, and maintain adequate barriers, lights, warning signs and other items as required for the protection and safety of workers, Regions Employees and the public.
- .2 The Contractor shall take all precautions necessary to avoid damage to the Region's lawns, parking areas, roadways, vegetation, signage and all other property, as well as on roads and streets adjoining the Region's property, and shall be responsible for the repair of all damage by any means necessary immediately upon receipt of notice of such condition by the Region.
- .3 The Contractor's parking area, storage area and access routes shall be as defined by the Region and strictly adhered to by the Contractor.
- .4 The Contractor shall take care when working near vehicles parked at any work site, to avoid debris from depositing on the vehicles. Care shall be taken to ensure that damage does not occur to vehicles parked on the sites, as a result of the Service performed under this Contract. The Region bears no responsibility to any vehicles parked near or at any work site.
- .5 Always protect landscape plantings and turf areas against damage of all kinds for duration of maintenance period. Maintenance includes temporary protections, fencing, barriers, and signs as required for protection. If any plant material or turf becomes damaged or injured because of insufficient protection, Contractor shall treat or replace plant material or turf at Contractor's sole expense.

#### **1.21 AIR QUALITY ADVISORIES**

- .1 Any and all maintenance that would impact on air quality (e.g. grass cutting, use of gas powered equipment) will cease on days when an Air Quality Advisory has been issued by the Ontario Ministry of Environment or the York Region Medical Officer of Health and will cease and recommence on the day the Air Quality Advisory has been cancelled.




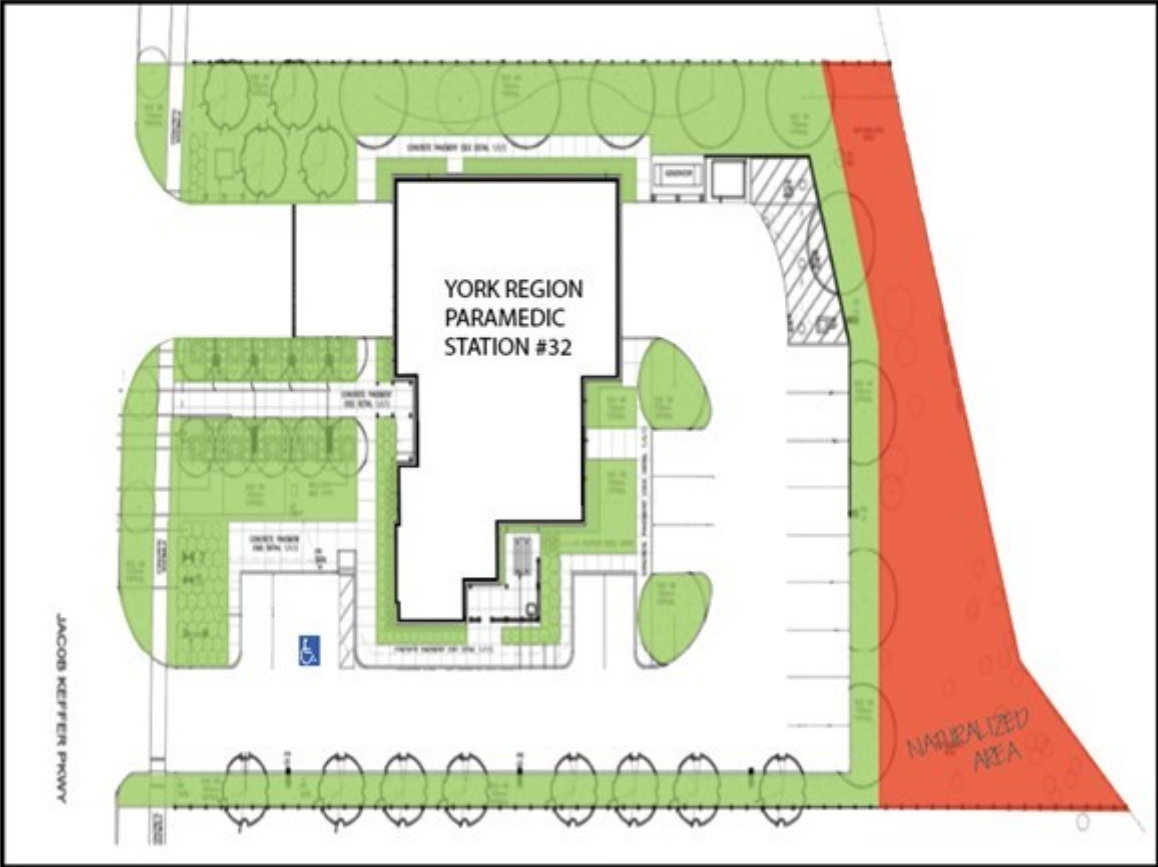
#### **1.22 FINAL ACCEPTANCE AND TERMINATION OF MAINTENANCE**

- .1 Work under this section may be accepted by the Region at the end of maintenance period provided all requirements for acceptance as indicated under the Contract Documents have been satisfactorily completed.

#### **1.23 MAINTENANCE INSTRUCTIONS**

- .1 Provide two (2) copies of detailed written maintenance instructions detailing the maintenance and care of all turf areas and plant material installed in contract.

## 1.24 PROPERTY PROFILE

		<b>SITE PROFILE</b>		Regional Municipality of York Property Services Branch	
<b>Site Information</b>					
Address:		53 Jacob Keffer Parkway			
Municipality:		Vaughan			
<b>Department:</b>		Community and Health Services - Paramedic and Senior Services			
<b>Site Name:</b>		Paramedic Response Station # 32			
<b>Closest Intersection:</b>		Jacob Keffer Parkway and Rutherford Road			
		<b>Legend</b> Area to be Cut  DO NOT CUT 			
					
<b>Summer Grounds Maintenance Special Instructions</b>					
<ul style="list-style-type: none"><li>- Cut grass area as indicated by the green highlights</li><li>- All rock and garden beds are to be maintained</li><li>- Area marked in red is a naturalized area and is not to be cut.</li></ul>					

## PART 2 – PRODUCTS

### 2.1 FERTILIZER

- .1 Turf Fertilizer: turf shall be fertilized with 4-4-2 OMRI (Organic Materials Review Institute: [www.omri.org](http://www.omri.org)) listed organic fertilizers.
- .2 Shurb and Tree Fertilizer: shall be fertilized with 8-5-5 OMRI listed organic fertilizer
- .3 Flower Garden Fertilizer: shall be fertilized with 14-14-14 OMRI listed organic fertilizer
- .4 “Weed and Feed” fertilizers are not permitted

### 2.2 TOPSOIL AND PEAT MOSS

- .1 Topsoil: fertile natural loam, capable of sustaining healthy growth, loose and friable, free of subsoil, clay lumps, stones in excess of 20 mm, live plants, roots or any other deleterious material greater than 20 mm diameter. Topsoil shall be free of litter, foreign matter and toxic materials harmful to plant growth. Topsoil containing construction debris, sod clumps, quackgrass or other noxious weeds is not acceptable. Topsoil supplied to site shall meet the following requirements:

- .1 Minimum 6% organic matter.
- .2 Acidity/alkalinity shall range from 5.9 pH to 7.0 pH.
- .3 Electrical Conductivity (E.C.) - level of soluble salts shall not exceed 1.5 dS/m.
- .4 Texture: “Loam Topsoil” in accordance with *Canadian System of Soil Classification*. Topsoil shall fall within an allowance of  $\pm 2\%$  of the values stated in the table below:

Soil	Sand (%)	Silt (%)	Clay (%)	Class
Topsoil	35	35	30	Loam

- .2 Peat Moss: decomposed plants, fairly elastic and homogeneous, free of decomposed colloidal residue, wood, sulphur and iron. Minimum of 80% organic matter by mass, pH value between 4.5 and 6.0. Furnished in an air-dry state, packed in standard bags or bales showing name of manufacturer.

### 2.3 WATER

- .1 Supply clean fresh water, water tanker, equipment, sprinklers, and labour necessary to adequately and efficiently apply water to all turf areas and plant materials.
- .2 Record quantity of water supplied and applied on site in maintenance log.

### 2.4 MULCH

1. Mulch: shall be organic, natural, shredded cedar.

### 2.5 PLANT PROTECTION MATERIALS

- .1 Rodent, Animal and Sun Protection
  - .1 Woven wire mesh: galvanized woven wire strands, 1.2 mm wire diameter or suitable alternative with an opening of 12.5 mm x 12.5 mm, c/w fasteners.
  - .2 Plastic: perforated spiralled strip for horticultural use.
  - .3 Burlap: clean, minimum 2.5 kg/m mass and 150 mm wide, and twine fastener.

## **2.6 PEST CONTROL**

- .1 Chemical Pest Control: supply and apply required chemical pesticides including herbicides, insecticides and fungicides, when Integrated Pest Management Principles (IPM) are considered ineffective in controlling or suppressing pest populations on site.
- .2 Submit the following information for Region's review and approval before applying any pesticide:
  - .1 Identification of specific pest(s) on site that require control.
  - .2 Trade name of chemical pesticide and manufacture's instructions for use.
  - .3 Manufacturer's material safety data sheets for each chemical pesticide.
  - .4 Name and credentials of licensed pesticide applicator(s).
- .3 Pesticide Application Records: pesticide application record books shall be completed by the certified licensed applicator in accordance with Ontario Environmental Protection and Enhancement Act. Submit record books at completion of each pesticide application on site. Provide information regarding target weed, insect or other pest, mode, type, and rates of application and results, including date, time, weather conditions and name of applicator.

## **2.7 MAINTENANCE SCHEDULE**

- .1 Schedule: submit a neat, legible and detailed maintenance schedule prior to commencement of maintenance period. List all daily, weekly, and monthly maintenance services and tasks to be performed. Review schedule with Region for approval.

## **PART 3 – EXECUTION**

### **3.1 GENERAL WORKMANSHIP**

- .1 Region will be the sole assessor of the Contractor's maintenance performance and workmanship.
- .2 Schedule timing of operations to growth, weather conditions and use of site. Do each operation continuously and complete within reasonable time period.
- .3 Do not perform work in any location or manner that may endanger the health and safety of the public.
- .4 Collect and dispose of excess material and debris to approved municipal disposal site following collection.
- .5 Coordinate maintenance practices with Region. Alter maintenance schedules, when necessary, to accommodate Region's site activities.
- .6 Contact Region when specified maintenance requirements cannot be met for any reason.
- .7 Submit name and contact number of company representative for immediate or emergency service when necessary.
- .8 Keep a copy of contract specifications and applicable reference documents on site at all times for employee use and reference.
- .9 Contractor's site supervisor must attend all site meetings called by Region to review workmanship and performance.

- .10 Contractor shall promptly correct all maintenance deficiencies noted by Region during site inspection meetings or following notification of Region's own work inspection results.

### **3.2 SPRING CLEAN-UP**

- .1 Complete spring clean-up by May 15<sup>th</sup> or sooner, weather permitting.
- .2 Remove and dispose of protective coverings and mulch used in winter protection.
- .3 Clean, sweep, collect and remove sand, rock chips, salt and other debris accumulated during winter months from all maintained turf and hard surface areas. Re-sweep turf and hard surface areas until completely clean and acceptable to Region. Dispose of all collected debris to approved municipal disposal site.
- .4 Collect and remove all dead vegetation, leaves, litter, and other debris from turf areas. Rake clean snow mound, where existing, from lawn areas.
- .5 Clean all plant beds, raised planters, tree wells, hedges and other landscaped areas of plant debris, leaves, litter, and other foreign matter. Remove collected debris from site.
- .6 Loosen and lightly cultivate non-mulched planting soil without disturbing roots of permanent plantings. Reinstall all loose plant bed edging materials and replace where necessary.
- .7 Sweep and clean hard surface areas and along curbs to remove all litter and debris to maintain clean and tidy site appearances.
- .8 Roll turf areas lightly where grass has lifted due to frost action. Repair damaged or deficient turf areas.

### **3.3 WATERING – TURF AREAS**

- .1 Provide proper and adequate watering services to all turf areas to ensure healthy vigorous growing conditions.
- .2 Seeded Areas: provide adequate watering of seeded areas to ensure proper seed germination and turf establishment. Supply and operate a portable and mobile irrigation system to water seeded turf areas as necessary until adequately and well established.
- .3 Sodded Areas: regularly and adequately apply water to all sodded areas. Water shall be deeply and thoroughly applied to keep new sod and underlying soil from drying out and to ensure healthy vigorous growing conditions are maintained. Apply water during early morning or evening to achieve efficient use of water.
- .4 Water Supply: Contractor shall supply clean water, water truck, pumps, portable sprinkler systems and labour and apply water as necessary to maintain healthy turf conditions.
- .5 Provide a minimum of 50 mm of water weekly including natural rainfall to wet upper 100 to 150 mm of soil in maintained turf areas.
- .6 During periods of drought stress, apply additional water to maintain healthy turf conditions if necessary.

### **3.4 TOPDRESSING AND RESEEDING**

- .1 Topdress and reseed areas which show root growth failure, deterioration, bare, burnt and thin spots, ruts, wash outs and erosion or which have been damaged by any means or cause, including replacement operations.



- .2 Mow grass to height of 40 mm. After mowing, rake thoroughly, removing loose and dead grass, stones and debris.
- .3 Spread topsoil to maximum thickness of 15 mm, filling in low areas and bare spots. For severely damaged turf areas place sufficient topsoil and rake level with finish grade.
- .4 Overseed areas with seed mixture equivalent to existing grasses and approved by Region. Seed at rate of 4 kg/100 m<sup>2</sup>.
- .5 Rake seed into topsoil. Roll lightly.
- .6 Water to ensure penetration of 80 mm and at frequent intervals to maintain vigorous growth.

### **3.5 SOD REPLACEMENT**

- .1 Cut out and remove all areas of dead, or unhealthy sod or which has been damaged by any means or cause and replace with new healthy sod. All repair areas to be square or rectangular.
- .2 Rake existing topsoil before installing new sod. Add topsoil to fill uneven and low areas.
- .3 Butt new sod tightly to adjacent existing sod. Topsoil open and exposed joints.
- .4 Water to ensure penetration of 80 mm and at frequent intervals to maintain healthy growth.

### **3.6 TURF ESTABLISHMENT AND EROSION**

- .1 Until turf areas are established, the Contractor shall be responsible for replacing soils that have eroded into hard surface areas. Residual soils on hard surfaces shall be removed and if not mingled with objectionable materials may be re-used in eroded areas. In the event this is a continuous problem, the Contractor shall install "jute mat" or other methods to prevent the erosion problem until the seeded turf areas are established.

### **3.7 FERTILIZING**

- .1 Fertilizers are to be applied twice a year, once in the spring and again in the fall.
- .2 Use only mechanical equipment to spread fertilizer. Check spreader calibration to ensure specified application rate is used.
- .3 Spread 50% of fertilizer in one direction, then 50% at right angles.
- .4 Water: apply water immediately after spreading fertilizer. Supply water, trucking and accessories and apply required water to all turf areas. Alternatively, Contractor shall time fertilizer applications prior to natural rainfall that will activate the fertilizer and produce the desired response. Ensure moisture penetration of 50 mm minimum.
- .5 Advise Region prior to any application of turf fertilizer. Upon completion of service, provide documentation along with invoice to support type and quantity of turf fertilizer applied.

### **3.8 MOWING - MAINTAINED AREAS**

- .1 Mowing Height: cut and maintain turf areas at required variable minimum heights respective of the growing season. During periods of active growth turf shall be mowed at minimum required mowing height. During hot dry conditions and slow growth periods turf shall be mowed at increased or maximum heights to maintain turf health. Turf shall generally be cut and maintained as follows:
  - .1 Sodded Turf: cut and maintain turf at 75 - 100 mm height.

- .2 Seeded Turf: during seed establishment, provide weed control in newly seeded areas by regularly mowing and maintaining weed growth to 100 mm height. Remove all weed and other plant debris from seeded turf areas. Provide initial cut when seeded grass growth is approximately 100 mm in height over 75% of the seeded area. Subsequently, mow seeded turf area at a height of approximately 80 mm.
- .3 Native Grass: provide weed control during seed establishment by mowing weed growth to 100 mm height and remove from site. Mow native seed areas during the last two weeks of June and August or as directed by Region. Mow tall growing native grass at a height of 135 to 150 mm and short growing native grass at a height of 90 to 100 mm. Do not mow native grass lower than specified. Provide an additional cut due to active and/or accelerated growth when directed by Region.
- .2 Mowing Schedule: mow turf areas on weekly intervals during periods of active growth and more frequently during accelerated growth periods to maintain turf at required height. During periods of hot dry seasonal climatic conditions and when turf growth is slow, turf shall be cut less frequently at an increased height to maintain turf health.
- .3 Mowing shall generally be performed when “one-third” of grass blade can be removed during a single cutting to achieve required turf height. Schedule and complete mowing in one continuous operation, weather permitting. Do not mow turf when insufficient growth is evident or cut turf lower than specified height.
- .4 Mow turf areas only when dry. Use mowers with sharp blades that will cut turf cleanly. Turf mowed when wet or with dull blades that tear and leaves ragged leaf edges are unacceptable. Region will periodically inspect mowers for acceptance.
- .5 During periods of extended moisture and excessive turf growth, increase mower blade height and pre-cut turf at an increased height. Remove clippings. After turf dries, lower blade height to specified height and mow turf a second time to achieve required height.
- .6 Small and unnoticeable grass clippings may be left on lawns that are regularly mowed at the desired height.
- .7 Remove papers, rocks, animal waste, and other foreign material before cutting.
- .8 Change direction of cut with each mowing to avoid soil compaction and turf wear or ruts from mower wheels. In the event that turf damage or ruts result, the Contractor shall immediately repair all damaged turf.
- .9 During each cutting operation, temporarily relocate movable site furnishings. Replace to approximate original location after mowing lawn.
- .10 Edging: use a fixed steel blade mechanical power edger to cut and provide neat, uniform, and cleanly defined edges along all sidewalks, concrete curbs, and other hard surfaces on site. Do not use monofilament trimmers for edging. Provide monthly edging services during June, July, August and September. Remove all edging debris from site.
- .11 If weather conditions prevent the cutting of grass or summer grounds maintenance activities from being performed on a regularly scheduled day, the work is to be performed as soon as weather permits. The Work shall not be deferred to the following week.

### 3.9 TRIMMING

- .1 Trim grass along fences, walls, sign posts, structures, monuments and other select lawn areas not accessible to mowers using a mechanical trimmer. Trim turf at a height no lower than 60 mm.

Never scalp turf or damage any plant when using trimmers. Remove resulting plant debris from site.

- .2 Use hand trimmers to trim grass adjacent to trees and other plants to prevent damage to tree trunks, plant stems and roots. Do not use string line trimmers near live plants.
- .3 Cut and neatly trim grass around irrigation equipment, manholes, valves and other surface features in lawn areas. Remove resulting plant debris from site.
- .4 Clean all sidewalks, stairs, roads, parking lots, curbs, hard surfaces, building walls and other required locations of all grass clippings after each mowing to maintain clean site appearances.

### **3.10 TURF AERATION**

- .1 Contractor shall in the fall, aerate to remedy soil compaction prior to October 14<sup>th</sup>.
- .2 Use a vertical motion coring aerator with hollow tines that penetrate the lawn, extract and deposit soil cores. Aeration cores shall be of minimum 50 mm depth and spaced no further than 90 mm apart. Ensure soil has adequate moisture before aerating.
- .3 Aerate in minimum two different directions to obtain good coverage. Remaining soil cores shall be left on site. Heavily used turf areas containing compacted soil conditions shall be aerated twice during the growing season.

### **3.11 TURF DETHATCHING**

- .1 Use a vertical cutting mower or adjustable power rake to dethatch lawn areas in early spring when dry. Remove all collected thatch debris from site.

### **3.12 TREE AND SHRUB MAINTENANCE**

- .1 Monitoring:
  - .1 Regularly monitor and visually inspect the health and care of all plants on site to ensure proper plant care is provided in accordance with specifications that will enable plants to grow in a vigorous, healthy and non-stressed condition.
  - .2 Contractor shall indicate results of each plant monitoring inspection in maintenance log.
- .2 Trees and Plant Beds:
  - .1 Maintain all planting locations each week during the maintenance period to ensure healthy and vigorous growing conditions and to ensure aesthetically clean and pleasing site appearances.
  - .2 Cultivate non-mulched plant beds and tree wells to maintain a loose friable soil free from perennial weeds and grass, including their roots. Pull weeds and roots by hand or spot spray with approved herbicide without damaging other plants. Do not mound soil around base of tree trunk following soil cultivation.
  - .3 Remove and dispose of all litter, debris, rubbish, and animal waste each week. Pick and remove all rocks larger than 15 mm from planted areas.
  - .4 Remove and eliminate perennial grass and weeds from all planted areas weekly. Maintain weed free appearances in all planted areas.
  - .5 Edge all plant beds evenly to depth of 100 mm monthly to maintain original line and shape using a sharp spade to make an angled cut. Remove all debris from site after edging.

- .6 Rake, level and re-spread wood mulch as necessary to achieve a fresh appearance and to correct any disturbances. Clean mulch of all debris and litter weekly. Remove all perennial weeds and grass as necessary. Place additional mulch to match existing, to maintain original specified depth.
- .7 Place specified planting media to correct settlement that occurs in planted areas and to correct all other grading deficiencies.
- .8 Straighten all leaning or sagging plants. Replant if necessary.
- .3 Soil Conditioning:
  - .1 Maintain specified soil conditions in plant beds to promote optimum growth and health for each plant.
- .4 Staking and Tree Protection:
  - .1 Keep stakes and guy wires taut and plants plumb for duration of maintenance period. Do not allow trees to be girdled from improper installation and maintenance of guy wires.
  - .2 Remove support stakes and staking accessories when plants become self-supporting or when directed by Region.
  - .3 Install and keep plant protection materials in proper repair and adjustment as required or when directed by Region.
- .5 Pruning:
  - .1 Prune in accordance with proper standards and practices described in ANSI A300. Region will be the sole assessor of the quality of all pruning operations. Promptly correct all deficient work as directed by Region.
  - .2 Prune to provide a natural branching structure and to encourage healthy natural growth patterns for each plant. Do not clip shrubs into balled or boxed forms as this type of pruning will be considered improper and unacceptable.
  - .3 Pruning shall be performed by Certified. Submit credentials of each individual who will perform plant pruning services for Region's approval.
  - .4 Use sharp pruning tools and equipment to prune plants without tearing and ripping plant tissue. Sterilize pruning tools [after completion of each plant cutting operation and] after pruning diseased plants.
  - .5 Do not shear or top any plant, strip lower branches, or raise crown of trees. Do not leave stub cuts when pruning any plant.
  - .6 Limit pruning to removal of dead, diseased or injured branches, stray branches, double leaders, water sprouts, suckers and to compensate for loss of roots as a result of transplanting. Remove undesirable, rubbing and crowded limbs and maintain an adequate clearance. Ensure coniferous trees have one dominant central leader.
  - .7 Replace improperly pruned plants if directed by Region, at no cost to the Region. Replacement plant shall match existing in size.
- .6 Fertilization Requirements in Early Spring:

- .1 Apply plant fertilizer as directed by Region. Use controlled or slow release plant fertilizers only. Notify Region prior to commencement of fertilization applications. Record all fertilization activities in maintenance log.
- .2 Trees: apply 10-6-4 or similar plant fertilizer to all trees by June 1st each spring at rate of 18 g/25mm of tree caliper. Use a deep root feeder in application of plant fertilizer and water to ensure each plant is thoroughly fertilized and watered.
- .3 Alternatively, place 16-10-9 or similar fertilizer spikes in ground at rate of one spike per 25 mm of caliper per tree around dripline of tree.
- .4 Plant Beds: spread 14-14-14 or similar granular fertilizer by June 1st each spring at minimum rate of 5 kg/100 m<sup>2</sup> into upper surface of all planting beds. Lightly rake into soil if applicable and apply water. Record all fertilization in maintenance log.
- .5 Supply clean water, water hauling equipment and all other accessories as necessary to apply adequate water after fertilizing to ensure penetration of fertilizer into soil and roots.
- .7 Watering of Plants:
  - .1 Monitoring: regularly test and monitor soil moisture conditions and a plant's need for water to ensure adequate health and survival. Natural rainfall should be considered in determining amount and frequency of watering. Regularly review plant watering needs with Region. Contractor, shall be responsible for ensuring that sufficient moisture is provided each week, as necessary, to maintain an adequate level of moisture within the root systems and ensure healthy plant growth and survival.
  - .2 Use moisture sensor devices to test and measure availability of moisture in plant soil areas throughout site. Record data in maintenance log.
  - .3 Water plants regularly each week as necessary to maintain healthy and vigorous growing conditions and to ensure survival. During periods of warm weather and dry soil conditions provide additional waterings to maintain plant health.
  - .4 Plant Watering: apply a minimum 40 liters of water per 25mm of tree trunk diameter (measure at 300mm above ground level) when watering. Apply sufficient water during each application to obtain moisture saturation of each plant's root ball. Record total quantity of water applied in maintenance log after each site visit to perform plant watering services.
  - .5 Supply clean fresh water, equipment, methods of transportation, water tanker, hoses and sprinklers, attachments and other accessories, including labour to adequately and efficiently apply water to all plants where other means of watering are inadequate, inefficient or not available.

### **3.13 MULCHING**

- .1 Contractor shall supply and install a minimum of 75mm of mulch to all gardens and shrubs to prevent weeds from emerging or being established.
- .2 The Work shall be performed in the Spring prior to May 30<sup>th</sup>.
- .3 Prior to applying the mulch, the garden soil shall be turned up and weeds removed.

### **3.14 PLANT REMOVAL AND REPLACEMENT**

- .1 Contractor shall immediately remove all dead, unhealthy and unappealing plants from site or when directed by Region. Promptly supply and install healthy new replacement plants to ensure

original landscape plan is maintained. Replacement plants shall meet specifications and be approved by Region.

- .2 Replacement plantings shall be performed in a timely manner and as soon as conditions permit. Contractor shall advise Region when availability of any replacement plant will be delayed.
- .3 All replacement plants must be fully established before termination of maintenance by Contractor. Contractor shall continue to provide specified maintenance for replacement plants not fully established until deemed acceptable by Region.
- .4 All replacement plants shall be flagged or tagged by Contractor for identification.
- .5 Contractor shall extend warranty on all plants not fully established by end of warranty period. Region will determine the additional warranty period on replacement plants if deemed necessary.

### **3.15 INTEGRATED PEST MANAGEMENT**

- .1 Integrated Pest Management (IPM):
  - .1 Manage and control pests using IPM principles that utilizes regular monitoring to identify pests, considers various control options (biological, physical, cultural, mechanical and chemical) before implementing an effective, economical and environmentally acceptable solution to prevent and suppress pests.
  - .2 Use IPM principles to reduce or eliminate a reliance on chemical pesticides.
- .2 Contractor shall be knowledgeable regarding the identification of pests on site, controls to be implemented in management of pests and assessing outcome of treatment actions. Inform Region of all pest concerns on site and controls to be implemented in management of pests. Record all information in maintenance log.

### **3.16 PESTS: WEED, INSECT AND DISEASE CONTROL**

- .1 Pest Monitoring:
  - .1 Pest Monitoring: regularly monitor and visually inspect all plants, turf and other landscape areas to identify potential pest problems and determine appropriate pest controls. Pest problems include insect, disease and weed infestations that pose a serious and on-going threat to plant life on site.
  - .2 Ensure proper, positive identification of infestations. Reference "Backyard Pest Management" for identification and control of pests.
  - .3 Indicate results of each monitoring inspection in maintenance log. Review all pest concerns with Region. Record all actions taken to control pest problems in log.
- .2 General Considerations:
  - .1 Use of chemical pesticides are restricted as Region supports the use of IPM practices. Advise Region on whether IPM practices are practical in managing and controlling any existing pests on site.
  - .2 Determine susceptibility of plant species to pesticide damage before requesting chemical pesticides. Request Region's approval before use, where chemical pesticides are deemed necessary in the management and control of pest infestations.

- .3 Applications of pesticides shall be performed in accordance with Alberta Environment's current legislation. Provide Region with three days advance notification of intent to apply chemical pesticides on site.
  - .4 Use equipment and containers free of harmful residues not related to specific control measures applicable to situation.
  - .5 Certified Applicator: when pesticides are deemed necessary to control pests, the application of each pesticide on site shall be performed by a certified pesticide applicator. Personnel assisting the certified applicator on site shall be thoroughly trained and knowledgeable in pesticide applications and use of all equipment in accordance with Alberta Environment's Code of Practice for Pesticides. Applicator shall maintain pesticide application record books and submit at completion of each pesticide application.
  - .6 Prepare and apply pesticide according to manufacturer's specifications. Minimize drift at all times. Erect signs to notify building occupants and the public regarding pesticide use on site.
  - .7 Timing: pesticides shall be applied at times, which limit any possibility of contamination from climatic and other factors. Monitor weather conditions to avoid making application prior to inclement weather to eliminate potential runoff from treated areas. Confine all applications to outside of regular site operation hours to avoid contamination from drift and its effect on surroundings, occupants of nearby buildings and site users.
  - .8 Ineffective and improper application of pesticide shall be immediately terminated and corrected by Contractor. Additional application of pesticides shall be completed approximately two weeks after initial application is noted as visibly inadequate or deemed deficient by Region.
- .3 Pest Control:
- .1 Weeds:
    - .1 Provide ongoing weed control and eradication methods during active growth and establishment, by cultivation, physical removal and use of approved chemical pesticides.
    - .2 Completely eliminate and remove from site all noxious weeds in accordance with government regulations.
    - .3 Control and elimination of weeds within soft and hard landscaped surfaces on site on an ongoing basis. Ensure weed seed heads are removed before maturity.
  - .2 Insects and Disease: apply pesticides based on development stage of insects' life cycles to prevent loss or damage to plant material. Monitor turf areas and plants and apply pesticides, if approved, to control pest infestations.
  - .3 Monitor effectiveness of each pesticide application and promptly correct any inadequate or deficient application.
  - .4 Repair and pay for damage caused by application of herbicides.
  - .5 Do not use soil sterilants.

### **3.17 FALL CLEAN UP & PREPARATION**

- .1 Fall cleanup shall be undertaken in October and be completed by November 1.
- .2 Leaf Removal: rake and vacuum fallen leaves weekly and remove from site to approved waste recycling depot. Continue until leaves cease to fall.

- .3 Clean all plant beds, planters, tree wells, mulched areas, and other landscaped areas on site weekly. Keep catch basins and all road and parking curbs clean and free of all debris. Remove all collected leaves and other debris to approved waste recycling depot.
- .4 Remove and dispose of annuals from plant beds and planters within one week after first killing frost or when directed by Region. Deep cultivate plant beds and planters.
- .5 Cut back foliage of perennial plants within one week after killing frost. Ornamental grass shall remain intact during winter and trimmed back the following spring unless directed otherwise by Region. Stake locations of cut perennials and apply organic mulch around plants for winter protection as necessary. Thoroughly water all perennial plants for winter.
- .6 Deep root water all plants between October 1<sup>st</sup> and 15<sup>th</sup> in preparation for winter. Supply water, trucking and other necessary accessories to adequately apply water to each plant. Trees to receive minimum 40 liters of water per 25 mm of trunk diameter (measure at 300 mm above ground level). Apply water throughout tree dripline area. Saturate root area of shrubs, perennials and other plants. Record total quantity of water applied in maintenance log after each day of plant watering activities. Indicate quantity of plants watered each day and their location in maintenance log. Provide additional deep root watering services when warm dry temperatures are experienced in late fall to maintain plant warranty.
- .7 Protect plants from rodent, animal and sun damages by installing appropriate protective materials.
- .8 Sweep and clean all walkways and other hard surface areas weekly. Remove all collected debris and litter from site.

### **3.18 CLEANLINESS OF GROUNDS**

- .1 Keep grounds in clean and tidy condition to ensure clean site appearances are continually maintained. Provide, on a weekly basis, clean-up services. Hand Sweep, or using leaf blower, clean, collect and remove all debris, litter, rubbish and pests from site grounds.
- .2 Provide prompt service within 3 hours when directed by Region to correct or complete clean-up services deemed inadequate or incomplete.
- .3 Pay all costs for collecting and disposing of excess material and debris to municipal disposal site following each site clean-up. Do not dispose of any debris in Region's disposal bins on site.
- .4 Sweep and clean all walkways and other hard surface areas [weekly] [as required]. Provide mechanical power wash equipment to clean and wash paved surfaces near buildings if directed by Region.
- .5 Keep site furnishings clean and in safe condition. Pressure wash and clean furnishings when necessary to maintain clean and sanitary appearances. [Regularly clean cigarette snuffers and other ashtray furnishings].
- .6 Record all cleaning services performed each week in maintenance log.

**END OF SECTION**



## **PART 1 - GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 QUALITY ASSURANCE
- 2.1 MATERIALS
- 3.1 EXAMINATION
- 3.2 TREE PRUNING
- 3.3 TREE PROTECTION
- 3.4 TREE REPAIR AND REPLACEMENT
- 3.5 FIELD QUALITY CONTROL

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 This section includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.

### **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.
- .2 Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and other Woody Plant Maintenance—Standard Practices (Pruning)."

## **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 and subject to the approval by Urban Forestry Services:
  - .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.
- .2 No ground breaking 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 The Tree Protection Zone (TPZ) shall be posted with signs.
- .5 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 (i.e.: 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 PRUNING**

- .1 Prune trees and plants indicated to remain that are affected by temporary and permanent construction.
- .2 Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
- .3 Pruning Standards: Prune trees according to ANSI A300.
  - .1 Type of Pruning: Cleaning, Raising, and Reduction.
- .4 Cut branches with sharp pruning instruments; do not break or chop.
- .5 Chip removed tree branches and dispose of off-site.

### **3.3 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 trees to be protected shall be pruned in accordance with Tree Pruning paragraphs above in this section.
- .6 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.
- .7 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.
- .8 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.
- .9 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.
- .10 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.
- .11 Obtain necessary permits, reports, and approvals.
- .12 Proceed with execution of specified work, under direction of the Consultant.
- .13 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.

### **3.4 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.
  - .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**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

### **1.2 RELATED WORK**

- |  |                  |
|--|------------------|
| .1 Site Grading                          | Section 31 23 13 |
| .2 Excavation, Trenching and Backfilling | Section 31 23 10 |
| .3 Aggregates: General                   | Section 31 05 17 |
| .4 Granular Base                         | Section 32 11 23 |

### **1.3 REFERENCES**

- .1 ASTM C 117-17, Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 131/C131M-14, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 C 136/C136M-14, Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D 422 (1990), Method for Particle-Size Analysis of Soils.
- .5 ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft-lbf/ft<sup>3</sup> 600 kN-m/m<sup>3</sup>.
- .6 CAN/CGSB-81.-88, Sieves Testing, Woven Wire, Inch Series.
- .7 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
- .8 Ontario Provincial Standard Specification 1010.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Refer to Section 32 11 23.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Granular sub-base material: Granular 'B', Type I or Type II, OPSS 1010, Section 31 05 17 and following requirements.
  - .1 Crushed, pit run or screened stone, gravel or sand consisting of hard durable angular particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

- .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

<u>Sieve Designation</u>	<u>% Passing Type I</u>
150 mm	100
26.5 mm	50-100
4.75 mm	20-100
1.18 mm	10-100
0.300 mm	2-65
0.075 mm	0-8

- .2 Other Properties as follows.

- .1 Plasticity Index ASTM D4318-84.0.
- .2 Crushed particles: at least 100% of particles by mass within each of the following sieve designation ranges to have at least 1 freshly fractured face for Type II. Not applicable for Type I material to be divided into ranges using methods of ASTM C135-84a.
- .3 Petrographic Number MTO LS609 Maximum 250.

<u>Passing</u>	<u>Retained on</u>
26.5	4.75 MM

- .4 Particles smaller than 0.02 mm AASHTO T88-78 maximum 3%.
- .5 Soaked CBR AASHTO T193-72 Min 40 when compacted to 100% of AASHTO T180.74 Method D.

Where indicated, **structural soil** is to be installed in lieu of granular sub-base. Structural soil as detailed later in this specification.

### PART 3 – EXECUTION

#### 3.1 PLACING

- .1 Compact subgrade to 95% of SPMDD. Excavate all weak and soft spots as required and replace with granular sub-base compacted uniformly to 100% of SPMDD.
- .2 Place granular sub-base after subgrade is inspected and approved by Consultant.
- .3 Construct granular sub-base to depth and grade in areas indicated.
- .4 Ensure no frozen material is placed.
- .5 Place material only on clean unfrozen surface, free from snow or ice.
- .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .7 For spreading and shaping materials, use spreader boxes having adjustable templates or screens which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

- .10 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 Efficiency of equipment not specified to proved at least as efficient as specified equipment at no extra cost and written approval must be received from Consultant before use.
- .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compaction in accordance with ASTM D698 and ASTM D1577.
  - .1 Pavement Sub-base: Compact to density of not less than 100% SPMDD.
  - .2 Backfill of subgrade weak or soft spots: Compact to density of not less than 98% of SPMDD.
- .5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .6 Apply water as necessary during compaction to obtain specified density.
- .7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Consultant.
- .8 Correct surface irregularities by loosening and adding or removing material unit surface is within specified tolerance.

### **3.3 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

### **3.4 INSPECTION AND TESTING**

- .1 Testing of materials and compaction will be carried out by testing laboratory designated by Owner. Frequency of tests will be determined by Consultant.
- .2 Owner will pay costs for inspection and testing.

### **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 accepted by Consultant.

### **SAMPLES AND SUBMITTALS**

A. At least 30 days prior to ordering materials, the Contractor shall submit to the Engineer's representative samples, certificates, manufacturers literature and certified tests for materials specified below. No materials shall be ordered until the required samples, certificates, manufacturer's literature and test results have been reviewed and approved by the Engineer. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Engineer reserves the right to reject, on or after delivery, any material that does not meet these specifications.

## **1.02 DELIVERY, STORAGE AND HANDLING**

A. Do not deliver or place soil in frozen, wet, or muddy conditions. Material shall be delivered at or near optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698). Do not deliver or place materials in an excessively moist condition (beyond 2 percent above optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698)).

B. Protect soils and mixes from absorbing excess water and form erosion at all times. Do not store materials unprotected from large rainfall events. Do not allow excess water to enter site prior to compaction. If water is introduced into the material after grading, allow material to drain or aerate to optimum compaction moisture content.

**END OF SECTION**



## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

### **1.2 RELATED WORK**

- |  |                  |
|--|------------------|
| .1 Site Grading                          | Section 31 23 13 |
| .2 Excavation, Trenching and Backfilling | Section 31 23 10 |
| .3 Aggregates: General                   | Section 31 05 17 |
| .4 Granular Sub-base                     | Section 32 11 19 |

### **1.3 REFERENCES**

- .1 ASTM C 117-17, Test Method for Material Finer than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 131/C131M-14, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 C 136/C136M-14, Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D698-12e2, Test Method 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 CAN/CGSB-81.-88, Sieves Testing, Woven Wire, Inch Series.
- .6 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
- .7 Ontario Provincial Standard Specification 1010.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver and stockpile aggregates in accordance with Section 31 05 17 – Aggregates General. Stockpile minimum 50% of total aggregate required prior to commencing operation.
- .2 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Granular base material: Granular 'A' Type I or Type II OPSS 1010, Section 31 05 17 and following requirements:

- .1 Crushed pit-run or screened stone, gravel or sand consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Gradations to be within limits of specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation		% Passing	
26.5	mm		100
19	mm	85 -	100
13.2	mm	65 -	90
9.5	mm	50 -	73
4.75	mm	35 -	55
1.18	mm	15 -	40
0.300	mm	5 -	22
0.150	mm	-	
0.075	mm	2 -	8

- .3 Plasticity Index ASTM D4318-17e1.
- .4 Los Angeles Abrasion ASTM C131/C131M-14 Gradation 'A' Max. % loss by weight: 60.
- .5 Crushed particles: at least 50% of particles by mass within each of following sieve designation ranges to have at least 10 freshly fractured face. Material to be divided into ranges using methods of ASTM C136-84a.

Passing	Retained on
19 mm	26.5 mm
4.75 mm	19 mm

- .6 Petrographic number MTO LS 69, Maximum 250.
- .7 Soaked CBR: AASHTO T193-72 when compacted to 100% of AASHTO T180-774 Method D, Min 80 for use under Portland cement and Min 100 for use under asphalt concrete.

## PART 3 – EXECUTION

### 3.1 SEQUENCE OF OPERATION

- .1 Place granular base after finished sub-base surface or subgrade is inspected and approved by Consultant.
- .2 Placing
  - .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

- .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment
  - .1 Compaction equipment to be capable of obtaining required material densities.
  - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Consultant before use.
  - .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting in accordance with ASTM D 698 and ASTM D 1557.
  - .1 Compaction of Pavement Base: Compact to density of not less than 100% SPMDD.
  - .2 Compaction of Concrete Slab on Grade or Concrete Sidewalks Base: Compact to density of not less than 100% of SPMDD.
  - .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 approved by Consultant.
  - .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

### 3.2 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

### 3.3 PROOF ROLLING

- .1 For proof rolling use roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 915 mm maximum.
- .2 Consultant may authorize use of other acceptable proof rolling equipment.
- .3 Proof roll top of base upon completion of fine grading and compaction.
- .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .5 Where proof rolling reveals defective areas:
  - .1 Remove base, sub-base and subgrade material to depth and extent directed by Consultant.
  - .2 Backfill excavated subgrade with sub-base material and compact in accordance with Section 31 23 10.
  - .3 Replace sub-base material and compact in accordance with Sections 31 23 10 and 32 11 19.

- .4 Replace base material and compact in accordance with this Section.

### **3.4 INSPECTION AND TESTING**

- .1 Testing of materials and compaction will be carried out under Cash Allowance by testing laboratory designated by Consultant. Frequency of tests will be determined by Consultant.

### **3.5 PROTECTION**

- .1 Maintain finished base in condition conforming to this section until succeeding material is applied or until acceptance by Consultant.

**END OF SECTION**

1. **GENERAL**

1.1. **General Requirements**

1. Read and be governed by conditions of the *Contract Documents*, including sections of Division 01.
2. Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

1.2. **Related Work**

- |                        |                  |
|------------------------|------------------|
| 1. Site Grading        | Section 31 23 13 |
| 2. Aggregates: General | Section 31 05 17 |
| 3. Granular Base       | Section 32 11 23 |
| 4. Granular Sub-Base   | Section 32 11 19 |

1.3. **Quality Assurance**

1. Plant requirements: Facilities for production and transportation or asphaltic mixture shall conform to OPSS Form 310.
2. Equipment Requirements: Self-powered mechanical pavers conforming to OPSS Form 310.
3. Rollers conforming to OPSS MUNI Form 310.

1.4. **Inspection**

1. Examine areas to receive the work of this Section and do not proceed until unsatisfactory conditions are corrected.
2. Notify the Consultant at least 24 hours prior to commencing work.
3. Do not commence work until the Consultant has inspected and approved surfaces to receive asphalt paving.

1.5. **Condition of Surfaces**

1. Prior to delivery of mixture, base surface shall be dry and free of all loose and foreign material.

1.6. **Temperature Requirements**

1. Prior to placing asphalt, air temperature at the base surface shall be a minimum of 7° C and rising.
2. Temperature of mixture shall not be less than 118° C immediately after spreading prior to initial rolling.
3. The asphalt cement shall be heated at the mixing plant only to the temperature required for satisfactory mixing and shall not exceed 162° C.

1.7. **Protection**

1. Conduct work without damaging other work. If other work is damaged, it shall be corrected to the approval of the Consultant without cost to the Owner.

2. **PRODUCTS**

2.1. **Materials**

1. Asphalt cement: conform to OPSS Form 1101.
2. Aggregates: conform to OPSS Form 1000 and 310.
3. Emulsified Asphalt: SS-1 emulsion conforming to OPSS Form 1103.

2.2. **Asphalt Mixes**

1. Asphalt Binding Course: HL8 conforming to OPSS Form 310.
2. Asphalt Surface Course: HL3 conforming to OPSS Form 310.

3. **EXECUTION**

3.1. **Preparation**

1. Clean surfaces of all loose and foreign materials.
2. Paint cold contact surfaces with emulsified asphalt.

3.2. **Installation**

1. Place asphalt paving in accordance with OPSS Form 310.
2. Compact asphalt to a minimum of 92% Maximum Theoretical Relative Density (MTRD).
3. Rolling shall continue until all roller marks are eliminated and no further compression is possible.
4. Hand tamp the asphalt with vibrating compactors adjacent to buildings, manhole covers and concrete curbs.
5. At the end of each day's work, or prolonged stoppage of asphalt paving, joints shall be formed by laying the asphalt and rolling it against a horizontal edge board of the proper thickness, placed across the entire width of the pavement.
6. Finished asphalt surfaces shall be straight and true to established levels, free from cracks, undrained areas or depressions exceeding 3 mm as measured with a 3 m straight edge in any direction. Asphalt thickness specified shall be maintained as minimum at any point.
7. Edges shall be neat and straight or properly curved as indicated, without broken, disintegrated or loose edges.
8. Backfill all curbs and pathways when complete in accordance with section 31 23 10

3.3. **Cleaning**

1. Remove asphalt stains from adjacent finished surfaces.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 SUBMITTALS
- 1.5 QUALITY ASSURANCE
- 2.1 PERFORMANCE/DESIGN REQUIREMENTS
- 2.2 MATERIALS
- 2.3 CONCRETE MIXES
- 2.4 INSTALLATIONS
- 3.1 EXAMINATION
- 3.2 GRANULAR BASE
- 3.3 FORMS
- 3.4 CONCRETE
- 3.5 EXPANSION AND CONTRACTION JOINTS
- 3.6 FIELD QUALITY CONTROL
- 3.7 ADJUSTING AND CLEANING

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Concrete *Site* work at exterior locations where not indicated on structural Drawings.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Mix designs:
  - .1 Well in advance of the first supply of concrete to the project submit, using the standard RMCAO form for "Concrete Mix Design Submission Form", project concrete mix designs for review. Include following information:
    - .2 Concrete strength.
    - .3 Exposure class.
    - .4 Water-cement ratio.
    - .5 Maximum aggregate size.
    - .6 Slump range.
    - .7 Plastic air range.

- .8 Describe in detail on the mix design summary and locations where each mix is to be placed in concrete *Site* work.

## 1.5 QUALITY ASSURANCE

### .1 Qualifications:

- .1 Installers / applicators / erectors: execute the work of this section only by a *Subcontractor*, with a minimum of 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.

### .2 Mock-ups:

- .1 *Provide* 1500 mm x 1500 mm area selected by the *Consultant*, complete with finish and pigment, in each required colour and finish, to act as trial area for acceptance of remainder of work of this section. When acceptable, quality of workmanship of balance of work of this Section shall match or exceed quality of accepted mock-up area.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE/DESIGN REQUIREMENTS

- .1 Construct municipal sidewalks in accordance with the requirements of the Authorities Having Jurisdiction.

### 2.2 MATERIALS

- .1 Cement: to CSA A3000-03, type 10, normal.
- .2 Water and aggregates: to CAN/CSA A23.1/A23.2-09.
- .3 Admixtures: to ASTM C494/C494M-11 for air entraining admixtures.
- .4 Free Draining Granular Fill: OPSS 1010 - April 2004, Granular 'A' with less than 5% passing the 75 um sieve.
- .5 Granular Fill: OPSS 1010 - April 2004, Granular 'B'.
- .6 Joint filler: 12.7 mm (1/2") thick asphalt impregnated fibreboard to ASTM D1751- 04(2013) e1.
- .7 Joint filler: 12.7 mm (1/2") thick sponge rubber to ASTM D1752-04a (2013).
- .8 Lumber: plywood and wood formwork to CAN/CSA A23.1/A23.2-09, free of defects where exposed.
- .9 Form stripping agent: colourless, mineral oil, free of kerosene, with viscosity minimum 70, maximum 110 second Saybolt Universal at 38 °C, flashpoint minimum 150 °C open cup.
- .10 Curing compound: chlorinated rubber type compound to ASTM C309-11, Type 2 (White), Class A.
- .11 Welded wire fabric: to ASTM A1064 / A1064M-14.
- .12 Billeted steel bars: to CAN/CSA G30.18-09.

### 2.3 CONCRETE MIXES

- .1 Comply with CAN/CSA A23.1/A23.2-09 and as follows; concrete exposed to chlorides shall be defined as concrete subject to pedestrian and vehicular traffic:



- .1 Structurally reinforced concrete exposed to chlorides with or without freezing and thawing conditions:
  - .1 Class of exposure (see Table 1): C-1.
  - .2 Minimum compressive strength (see Table 2): 35 MPa at 28 Days.
  - .3 Maximum water-to-cementing materials ratio (see Table 2): 0.40.
  - .4 Air content category (see Table 4): Category 1.
- .2 Non-structurally reinforced (i.e., plain) concrete exposed to chlorides and freezing and thawing:
  - .1 Class of exposure (see Table 1): C-2.
  - .2 Minimum compressive strength (see Table 2): 32 MPa at 28 Days.
  - .3 Maximum water-to-cementing materials ratio (see Table 2): 0.45.
  - .4 Air content category (see Table 4): Category 1.
- .3 Concrete in an unsaturated condition exposed to freezing and thawing but not to chlorides:
  - .1 Class of exposure (see Table 1): F-2.
  - .2 Minimum compressive strength (see Table 2): 25 MPa at 28 Days.
  - .3 Maximum water-to-cementing materials ratio (see Table 2): 0.55.
  - .4 Air content category (see Table 4): Category 2.
- .2 Accelerating admixtures may be used subject to approval in cold weather. If approved by the *Consultant*, use of admixture shall not relax cold weather placement requirements of CAN/CSA A23.1/A23.2-09. Use of calcium chloride is not permitted.

## 2.4 INSTALLATIONS

- .1 Cast-in-Place Concrete Curbs: Construct to dimensions and in locations as shown on the Drawings.
- .2 Cast-in-Place Concrete Sidewalks: *Provide* to extents indicated, 150 mm (6") thick, unless otherwise indicated.
- .3 Flag Pole Bases:
  - .1 FPB-1 - to be cast-in-place concrete, as indicated, with exposed formwork to be Classica 610R breakaway form as supplied by ArtFORMS International Inc., tel: 905- 642-3225 or equivalent.
- .4 Lamp Standard Bases:
  - .1 LSB-LOW - to be cast-in-place concrete, as detailed on the Drawings, with exposed formwork to be Newavea 510R – Low, as supplied by ArtFORMS International Inc., tel: 905-642-3225 or equivalent.
  - .2 LSB-HIGH - to be cast-in-place concrete, as detailed on the Drawings, with exposed formwork to be Newavea 510R – High, as supplied by ArtFORMS International Inc., tel: 905-642-3225 or equivalent.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- .1 Ensure that sub-grade of compacted fill conforms to elevations and sections before placing granular base material.

### 3.2 GRANULAR BASE

- .2 Place and compact fill materials in continuous horizontal layers not exceeding 200 mm (8") loose depth. Use methods to prevent disturbing or damaging buried services, foundation drainage system, waterproofing or dampproofing. Make good any damage.
- .3 Backfilling: Use granular material, either Granular 'B' or selected excavated material from the *Place of the Work* approved by a geotechnical Professional Engineer, to subgrade level. Compact to at least 98% of its SPMDD. Use free draining Granular 'B'; against foundation walls.
- .4 Place Granular 'A' base to minimum 150 mm (6") compacted thickness, unless otherwise indicated.
- .5 Compact granular bases to 98% SPMDD to ASTM D698-12(2014) e1 Standard Proctor Maximum Dry Density (SPMDD).

### 3.3 FORMS

- .1 Construct wood forms for unsupported concrete edges, to *Provide* straight lines and smooth flowing curved lines as indicated. *Provide* architectural grade formwork and concrete ties in pattern and design as indicated or as approved by the *Consultant*, for exposed concrete work. Apply form stripping agent to surfaces in contact with concrete. Remove forms when concrete fully cured.

### 3.4 CONCRETE

- .1 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .2 Screed concrete to required levels, to tolerance of 12.7 mm (1/2") in 3050 mm (10').
- .3 Finish concrete with consistent directional screeded broom finish.
- .4 Tooled crack control joints to walks at 1525 mm (5'0") centre/centre.
- .5 Apply curing compound to exposed concrete surfaces in accordance with manufacturer's installation instructions.

### 3.5 EXPANSION AND CONTRACTION JOINTS

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals as indicated on the *Site* plan and in accordance with Section 03 30 53.
- .2 Install expansion joints, 12.7 mm thick, at a maximum of 5000 mm on centre for sidewalks, 3600 mm on centre maximum for cast-in-place curbs, and 3000 mm on centre in both directions on the exterior concrete slab on grade.
- .3 Install expansion joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .4 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

- .5 Place impregnated asphaltic expansion strips in expansion joints.

### **3.6 FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00.

### **3.7 ADJUSTING AND CLEANING**

- .1 Clear away excess and waste materials and debris resulting from the work of this Section.

**END OF SECTION**

1. **GENERAL**

1.1. **General Requirements**

1. Read and be governed by conditions of the *Contract Documents*, including sections of Division 01.
2. Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

1.2. **Related Work**

- |  |                  |
|--|------------------|
| 1. Excavating, Trenching and Backfilling | Section 31 23 10 |
| 2. Granular Base                         | Section 32 11 23 |
| 3. Granular Sub-Base                     | Section 32 11 19 |
| 4. Asphalt Paving                        | Section 32 12 16 |

1.3. **References**

1. Canadian Standards Association (CSA)
  1. CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
2. Canadian General Standards Board (CGSB)
  1. CAN/CGSB-1.2-M89, Boiled Linseed Oil
  2. CAN/CGSB-3.3-M89, Kerosene
3. American Society for Testing and Materials (ASTM).
  1. ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>)
4. Ontario Provincial Standard Specification 353.

2. **PRODUCTS**

2.1. **Materials**

1. Concrete mixes and material shall conform to Ontario Provincial Standard Specifications 1301, 1302, 1303, 1305, 1306, 1308, 1315, and 1350. Concrete for curb and toe wall construction shall have a minimum compressive strength of 30 MPa after 28 days.
2. Granular Base and Sub-Base: to Section 32 11 23 and 32 11 19 respectively.
3. Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water soluble soap.
4. Fill material: to Section 31 23 10.
5. Boiled linseed oil: to CAN/CGSB-1.2.
6. Kerosene: to CAN/CGSB-3.3.

3. **EXECUTION**

3.1. **Grade Preparation & Sub-Base Course**

1. Grading: to Section 32 23 13.
2. Place sub-base course of OPSS Granular 'B', Type I in maximum 150 mm loose lifts and compact to a minimum of 100% of SPMDD.

3.2. **Granular Base**

1. Obtain Consultant's approval of subbase before placing granular base.
2. Place compacted OPSS Granular 'A' to depth, lines and widths as indicated.
3. Compact granular base to a minimum of 100% of SPMDD.

3.3. **Concrete**

1. Obtain Consultant's approval of granular base.
2. Do concrete curb construction in accordance with OPSS MUNI 353.
3. Provide 1.0m. wide depressions in curb where specified on the drawings as required to allow surface drainage to be conveyed to adjacent bio-swale areas.

3.4. **Tolerances**

1. Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.5. **Expansion and Contraction Joints**

1. Joints are to be constructed in accordance with OPSS 353.07.07

3.6. **Curing**

1. Cure concrete by adding moisture continuously in accordance with CAN/CSA-A23.1 to exposed finished surfaces for at least 1 day after placing or sealing moisture in by curing compound approved by Consultant.
2. Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
3. Apply curing compound evenly to form continuous film. In accordance with manufacturer's requirements.
4. Concrete curing is to be in accordance with OPSS MUNI 904.

3.7. **Linseed Oil Treatment**

1. After concrete has cured for specified curing time and when surface of concrete is dry, apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters.

3.8. **Backfill**

1. Allow concrete to cure for 7 days prior to backfilling.
2. Backfill to designated elevations with material approved by Consultant. Compact and shape to required contours as indicated or as directed by Consultant.

3.9. **Defective Concrete**

1. Concrete is defective when:
  1. Containing excessive honeycombing or embedded debris.
  2. Concrete damaged by freezing or which is unsatisfactory due to placement at too high a temperature.
  3. Average 28-day strength of any three consecutive strength tests is less than specified minimum 28-day strength.
  4. Any 28-day strength test result is more than 3.5 MPa below the specified minimum

28-day strength.

2. Repair of defective concrete work:
  1. Repair defective areas while concrete is still plastic, otherwise wait until curing is completed. Use repair methods approved by Consultant.
  2. Grind off high surface variations where directed by Consultant.
3. Remove and replace defective concrete where directed by Consultant:
  1. Remove between joints by sawing through concrete across full width.
  2. Replace with new concrete to this Section as directed by Consultant.
  3. Construct contraction joint between sawn face of existing concrete and face of new concrete.
  4. Install tie bars between old and new concrete as directed by Consultant.

3.10. **Field Quality Control**

1. Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Consultant in accordance with CAN/CSA-A23.1.
2. Consultant may take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

### **1.2 RELATED WORK**

- |  |                  |
|--|------------------|
| .1 Excavating, Trenching and Backfilling | Section 31 23 10 |
| .2 Granular Base                         | Section 32 11 23 |
| .3 Granular Sub-Base                     | Section 32 11 19 |
| .4 Asphalt Paving                        | Section 32 12 16 |

### **1.3 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.2-M89, Boiled Linseed Oil
  - .2 CAN/CGSB-3.3-M89, Kerosene
- .3 American Society for Testing and Materials (ASTM).
  - .1 ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>)
  - .2 Ontario Provincial Standard Specifications 1301, 1302, 1303, 1306, 1308, 1315, and 1350.
  - .3 Ontario Provincial Standards Drawing No. 310.010

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Concrete mixes and material: to Section 03 30 00.
- .2 Joint filler and Curing Compound: to Section 03 30 00.
- .3 Granular Base and Sub-Base: to Section 32 11 23 and 32 11 19 respectively.
- .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 10.

- .6 Boiled linseed oil: to CAN/CGSB-1.2.
- .7 Kerosene: to CAN/CGSB-3.3.

### **PART 3 – EXECUTION**

#### **3.1 GRADE PREPARATION & SUB-BASE COURSE**

- .1 Grading: to Section 31 23 13.
- .2 Compact subgrade to 95% of Standard Proctor Maximum Dry Density (SPMDD). Excavate and fill all weak and soft spots as required and backfill with compacted granular 'B', Type I to 100% SPMDD.

#### **3.2 CONCRETE**

- .1 Obtain Consultant's approval of granular base and reinforcing steel prior to placing concrete.
- .2 Do concrete work in accordance with Section 03 30 00.
- .3 Immediately after floating, give concrete walkway surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
- .4 Provide edging as indicated with 10 mm radius edging tool.
- .5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Consultant can be demonstrated. Hand finish surfaces when directed by Consultant.

#### **3.3 TOLERANCES**

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

#### **3.4 EXPANSION AND CONTRACTION JOINTS - CONCRETE WALKWAYS**

- .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 1.5 m.
- .2 Install expansion joints at intervals of 6 m.
- .3 Install expansion joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .4 Seal expansion joints with sealant approved by Consultant.

#### **3.5 CURING**

- .1 Cure concrete by adding moisture continuously in accordance with CAN/CSA-A23.1 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound approved by Consultant.
- .2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
- .3 Apply curing compound evenly to form continuous film. In accordance with manufacturer's requirements.



### **3.6 LINSEED OIL TREATMENT**

- .1 After concrete has cured for specified curing time and when surface of concrete is dry, apply two coats of linseed oil mixture uniformly to surfaces of curbs, walks and gutters.

### **3.7 BACKFILL**

- .1 Allow concrete to cure for 7 days prior to backfilling.
- .2 Backfill to designated elevations with material approved by Consultant. Compact and shape to required contours as indicated or as directed by Consultant.

### **3.8 DEFECTIVE CONCRETE**

- .1 Concrete is defective when:
  - .1 Containing excessive honeycombing or embedded debris.
  - .2 Concrete damaged by freezing or which is unsatisfactory due to placement at too high a temperature.
  - .3 Average 28-day strength of any three consecutive strength tests is less than specified minimum 28-day strength.
  - .4 Any 28-day strength test result is more than 3.5 MPa below the specified minimum 28-day strength.
- .2 Repair of defective concrete work:
  - .1 Repair defective areas while concrete is still plastic, otherwise wait until curing is completed. Use repair methods approved by Consultant.
  - .2 Grind off high surface variations where directed by Consultant.
- .3 Remove and replace defective concrete where directed by Consultant:
  - .1 Remove between joints by sawing through concrete across full width.
  - .2 Replace with new concrete to this Section as directed by Consultant.
  - .3 Construct contraction joint between sawn face of existing concrete and face of new concrete.
  - .4 Install tie bars between old and new concrete as directed by Consultant.

### **3.9 FIELD QUALITY CONTROL**

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Consultant in accordance with CAN/CSA-A23.1.
- .2 Consultant may take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 2.1 Materials
- .7 3.1 Preparation
- .8 3.2 Application
- .9 3.3 Adjusting and Cleaning
- .10 3.4 Protection

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Painted pavement markings and linework including:
    - .1 Parking stall and drive aisle linework.
    - .2 Symbols and markings for barrier free parking.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
  - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.

### **1.5 QUALITY ASSURANCE**

- .1 Qualifications: The *Contractor* shall *Provide* work of this Section, executed by competent installers with a minimum of five years' experience in application of *Products* specified.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Paint: in accordance with CAN/CGSB 1.74-2001 AMEND NO.1 Alkyd Traffic Paint - Amendment No. 1, low VOC alkyd traffic paint, in colours to the *Consultant's* selection.
  - .1 Maximum Volatile Organic Compound (VOC) limits; exterior:
    - .1 Flat paints: <100 g/L.
    - .2 Non-flat paints: <200 g/L.

## **PART 3- EXECUTION**

### **3.1 PREPARATION**

- .1 Substrate surfaces to be free from surface water, frost, ice, dust, oil, grease and other foreign materials.

### **3.2 APPLICATION**

- .1 Lay out pavement and slab markings.
- .2 Apply paint only when air temperature is above manufacturer's recommended temperature and no rain is forecast.
- .3 Symbols, numbers, letters, and text to conform to dimensions indicated, 150 mm (6") minimum. Apply letters, numbers, and text of legible size to parking stalls and drive aisles. Number sequence and text to the *Consultant's* selection.
- .4 Symbols and markings for barrier free parking in accordance with CAN/CSA B651-12, and to requirements of the *Authorities Having Jurisdiction*.
- .5 Paint lines to be of uniform colour and density with sharp edges, 100 mm (4") wide, unless otherwise indicated in the *Contract Documents*.

### **3.3 ADJUSTING AND CLEANING**

- .1 Remove paint where spilled, splashed, splattered, or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty paint cans each *Day* and safely dispose of same in accordance with requirements of the *Authorities Having Jurisdiction*.
- .4 Clean equipment and dispose of wash water/solvents as well as other cleaning and protective materials (e.g. rags, drop cloths, masking papers, and the like), paints, thinners, paint removers/strippers in accordance with safety requirements of the *Authorities Having Jurisdiction*.

### **3.4 PROTECTION**

- .1 Keep traffic off wet paint for period of time as recommended by paint manufacturer.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Closeout Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Field Conditions
- .8 2.1 Performance/Design Requirements
- .9 2.2 Materials
- .10 3.1 Installation
- .11 3.2 Field Quality Control
- .12 3.3 Adjusting and Cleaning
- .13 3.4 Protection

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Tactile warning surfacing at locations indicated in the *Contract Documents*.

### **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 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.

## **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit closeout submittals in accordance with Section 01 77 00.
- .2 Maintenance data:
  - .1 Submit manufacturer's maintenance instructions for inclusion in the operation and maintenance manuals.

## **1.6 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installers / applicators / erectors: 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-ups:
  - .1 Provide a mock-up size and location as approved by Consultant.
  - .2 Locate at the Place of the Work as part of final installation.

## **1.7 FIELD CONDITIONS**

- .1 Ambient conditions:
  - .1 Maintain minimum temperature of 5°C in spaces to receive tactile warning surfaces for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.

## **PART 2 - PRODUCTS**

### **2.1 PERFORMANCE/DESIGN REQUIREMENTS**

- .1 Tactile warning surfacing, where required as a tactile attention indicator by the building code, shall conform to sentence (2) and Clauses 4.1.1 and 4.1.2 of ISO 23599, "Assistive Products for Blind and Vision-Impaired Persons – Tactile Walking Surface Indicators."

### **2.2 MATERIALS**

- .2 Cast-in-place, tactile warning surfacing plates, exterior:
  - .1 Fabricated from grey cast iron, Class 35B to ASTM A48.
  - .2 Size: As indicated in Contract Documents.
  - .3 Color: Federal Yellow
  - .4 Basis of design:
    - .1 Kinesik 'Advantage Cast Iron Tactile Walking Surface Indicator'.
    - .2 Substitutions: in accordance with Section 01 25 00.

## **PART 3- EXECUTION**

### **3.1 INSTALLATION**

- .1 Install tactile warning surfacing in accordance with tactile warning surfacing manufacturer's instructions and recommendations, to locations indicated, scheduled, or required by authorities having jurisdiction.

### **3.2 FIELD QUALITY CONTROL**

- .1 Conduct quality control in accordance with Section 01 45 00.
- .2 Manufacturer's field review to be in accordance with Section 01 45 00.

### **3.3 ADJUSTING AND CLEANING**

- .1 Clean tiles by method recommended by tile manufacturer not less than 4 days prior to inspection for Substantial Performance of the Work.

### **3.4 PROTECTION**

- .1 Protect tiles and installation against damage during construction period in accordance with the tile manufacturer's instructions and recommendations.
- .2 Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood in accordance with tile manufacturer's instructions and recommendations.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- 1.1 GENERAL INSTRUCTIONS
- 1.2 SECTION INCLUDES
- 1.3 SUMMARY
- 1.4 SUBMITTALS
- 1.5 QUALITY ASSURANCE
- 2.1 EXTERIOR CHAIN LINK FENCE
- 2.2 EXTERIOR COMPOSITE WOOD FENCE
- 3.1 EXTERIOR CHAIN LINK FENCE
- 3.2 PREPARATION
- 3.3 FRAMEWORK INSTALLATION
- 3.4 CHAIN LINK FABRIC INSTALLATION
- 3.5 NUTS AND BOLTS
- 3.6 EXTERIOR CHAIN LINK FENCE

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Chain Link Fences
  - .2 Composite Wood Fences

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00.
- .2 Shop drawings:
  - .1 Drawings to indicate: materials, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, dimensions, details and accessories.

### **1.5 QUALITY ASSURANCE**

- .1 Qualifications: *Provide* work of this Section, executed by competent installers with a minimum of 5 years' experience in application of Products, systems and assemblies specified and with approval and training of *Product* manufacturers.

## **PART 2– PRODUCTS**

### **2.1 EXTERIOR CHAIN LINK FENCE**

- .2 Refer to Chain Link Fence Detail on the Drawings for chain link fence materials.

## 2.2 EXTERIOR COMPOSITE WOOD FENCE

- .1 Composite wood for exterior fences:
  - .1 Composite wood: TruNorth Solid Core as manufactured by:  
TruNorth Composites, 490 Elgin St #3, Brantford, ON N3S 7P8
  - .1 Colour: Ash Grey
- .2 Steel Framing: in accordance with Section 05 50 00 – Metal Fabrications

## PART 3- EXECUTION

### 3.1 EXTERIOR CHAIN LINK FENCE

#### 3.2 PREPARATION

- .1 Clearing: surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence
- .2 Stake out: prior to proceeding with fence installation, obtain the approval of the *Consultant*, in writing, of fence location stake out.

#### 3.3 FRAMEWORK INSTALLATION

- .1 Set posts in concrete footings to the height required in Sonotube forms.
  - .1 *Provide* post footings according Chain Link Fence Detail on the Drawings.
- .2 Rails:
  - .1 Top rail: Install 6400 mm (21 ft.) lengths of rail continuous thru the line post or barb arm loop top. Splice rail using top rail sleeves minimum 152 mm (6 in.) long. The rail shall be secured to the terminal post by a brace band and rail end.
  - .2 Intermediate rail: Field cut and secured to the line posts using boulevard bands or rail ends and brace bands.
- .3 Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 1830 mm (6 ft) and higher and for fences 1525 mm (60") in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.
- .4 Tension wire: Shall be installed 100 mm (4") up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 100 mm (4") down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using brace band. Secure the tension wire to the chain link fabric with a 9-gauge hog rings 450 mm (18") on centre and to each line post with a tie wire.

#### 3.4 CHAIN LINK FABRIC INSTALLATION

- .1 Install fabric to side of the framework as per the Drawings or to later instruction by the *Consultant*.
- .2 Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 8 mm (5/16") carriage bolts spaced no greater than 305 mm (12") on centre.



- .3 Small mesh fabric less than 25.4 mm (1"), attach to terminal post by sandwiching the mesh between the post and a vertical 50 mm (2") wide by 4.76 mm (3/16 in.) steel bar using carriage bolts, thru bolted thru the bar, mesh and post spaced 381 mm (15 in.) on centre.
- .4 Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 305 mm (12") on centre and to rail spaced no greater than 450 mm (18") on centre.
- .5 Secure fabric to the tension wire with hog rings spaced no greater than 450 mm (18") apart. Excess wire shall be cut off and bent over to prevent injury.
- .6 Ensure space between bottom of fabric and solid surface is no greater than 50 mm (2") in any location.

### **3.5 NUTS AND BOLTS**

- .1 Carriage bolts used for fittings shall be installed with the head on the secure side of the fence.
- .2 Bolts shall be peened over to prevent removal of the nut.

### **3.6 EXTERIOR CHAIN LINK FENCE**

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Quality Assurance
- .6 2.1 Exterior Chain Link Fence
- .7 3.1 Preparation
- .8 3.2 Framework Installation
- .9 3.3 Chain Link Fabric Installation
- .10 3.4 Nuts and Bolts

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 Chain link fences.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Shop Drawings*:
  - .1 *Shop Drawings* to indicate materials, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, dimensions, details and accessories.

### **1.5 QUALITY ASSURANCE**

- .1 Qualifications: The *Contractor* shall *Provide* work of this Section, executed by competent installers with a minimum of five years' experience in application of *Products*, systems and assemblies specified and with approval and training of *Product* manufacturers.

## **PART 2– PRODUCTS**

### **2.1 EXTERIOR CHAIN LINK FENCE**

- .1 Refer to Chain Link Fence Detail on the *Drawings* for chain link fence materials.

## **PART 3- EXECUTION**

### **3.1 PREPARATION**

- .1 Clearing: surveying, clearing, grubbing, grading and removal of debris for the fence line or any required clear areas adjacent to the fence
- .2 Stake out: prior to proceeding with fence installation, obtain the approval of the *Consultant*, in writing, of fence location stake out.

### 3.2 FRAMEWORK INSTALLATION

- .1 Set posts in concrete footings to the height required in Sonotube or equivalent forms.
  - .1 *Provide* post footings according Chain Link Fence Detail on the *Drawings*.
- .2 Rails:
  - .1 Top rail: Install 6400 mm (21 ft.) lengths of rail continuous thru the line post or barb arm loop top. Splice rail using top rail sleeves minimum 152 mm (6 in.) long. The rail shall be secured to the terminal post by a brace band and rail end.
  - .2 Intermediate rail: Field cut and secured to the line posts using boulevard bands or rail ends and brace bands.
- .3 Terminal posts: End, corner, pull and gate posts shall be braced and trussed for fence 1830 mm (6 ft) and higher and for fences 1525 mm (60") in height not having a top rail. The horizontal brace rail and diagonal truss rod shall be installed in accordance with ASTM F567.
- .4 Tension wire: Shall be installed 100 mm (4") up from the bottom of the fabric. Fences without top rail shall have a tension wire installed 100 mm (4") down from the top of the fabric. Tension wire to be stretched taut, independently and prior to the fabric, between the terminal posts and secured to the terminal post using brace band. Secure the tension wire to the chain link fabric with a 9-gauge hog rings 450 mm (18") on centre and to each line post with a tie wire.

### 3.3 CHAIN LINK FABRIC INSTALLATION

- .1 *Install* fabric to side of the framework as per the *Drawings* or to later instruction by the *Consultant*.
- .2 Attach fabric to the terminal post by threading the tension bar through the fabric; secure the tension bar to the terminal post with tension bands and 8 mm (5/16") carriage bolts spaced no greater than 305 mm (12") on centre.
- .3 Small mesh fabric less than 25.4 mm (1"), attach to terminal post by sandwiching the mesh between the post and a vertical 50 mm (2") wide by 4.76 mm (3/16 in.) steel bar using carriage bolts, thru bolted thru the bar, mesh and post spaced 381 mm (15 in.) on centre.
- .4 Chain link fabric to be stretched taut free of sag. Fabric to be secured to the line post with tie wires spaced no greater than 305 mm (12") on centre and to rail spaced no greater than 450 mm (18") on centre.
- .5 Secure fabric to the tension wire with hog rings spaced no greater than 450 mm (18") apart. Excess wire shall be cut off and bent over to prevent injury.
- .6 Ensure space between bottom of fabric and solid surface is no greater than 50 mm (2") in any location.

### 3.4 NUTS AND BOLTS

- .1 Carriage bolts used for fittings shall be installed with the head on the secure side of the fence.
- .2 Bolts shall be peened over to prevent removal of the nut.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 References
- .5 1.5 System Description
- .6 1.6 Submittals
- .7 1.7 Delivery, Storage, and Handling
- .8 1.8 Warranties
- .9 2.1 Manufacturers
- .10 2.2 Composite wood for exterior fences:
- .11 3.1 Examination
- .12 3.2 Preparation
- .13 3.3 Installation
- .14 3.4 Cleaning
- .15 3.5 Protection

### **1.3 SUMMARY**

- .1 Section Includes:
  - .1 Wood composite fences.
  - .2 Wood composite gates

### **1.4 REFERENCES**

- .1 A. ASTM International (ASTM):
  - .1 C94 - Standard Specification for Ready-Mixed Concrete.
  - .2 C177-04 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
  - .4 D143-94(2000) - Standard Test Methods for Small Clear Specimens of Timber.
  - .5 D198-05 - Standard Test Methods of Static Tests of Lumber in Structural Sizes.
  - .6 D1037-06 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle
  - .7 Panel Materials.
  - .8 D1413-05 - Standard Test Method for Wood Preservatives by Laboratory Soil-Block Cultures.
  - .9 D1761-06 - Standard Test Methods for Mechanical Fasteners in Wood.

- .10 D1929-96(2001) - Standard Test Method for Determining Ignition Temperature of Plastics.
- .11 D2047-04 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring
- .12 Surfaces as Measured by the James Machine.
- .13 D2394-05 - Standard Methods for Simulated Service Testing of Wood and Wood-Base Finish
- .14 Flooring.
- .15 D2395-06 - Standard Test Methods for Specific Gravity of Wood and Wood-Based Materials.
- .16 D4761-05 - Standard Test Methods for Mechanical Properties of Lumber and Wood-Base
- .17 Structural Material.
- .18 E84-07 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .19 F1679-04 Standard Test Method for Using a Variable Incidence Tribometer (VIT).
- .2 American Wood Preservers Association (AWPA) E1-06 - Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites.

## **1.5 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Design fence system to withstand 110 MPH steady wind and 130 MPH gusting wind tests.

## **1.6 SUBMITTALS**

- .1 Submittals for Review:
  - .1 Product Data: Indicate sizes, profiles, surface finishes, and performance characteristics.
  - .2 Samples: 300mm long samples illustrating each size, profile, color, and surface finish.
- .2 Closeout Submittals:
  - .1 Maintenance Data: Manufacturer's instructions on care and cleaning of wood composite products.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store, and handle wood composite in accordance with manufacturer's instructions.
- .2 Do not stack wood composite over 12 feet high.
- .3 Cover wood composite with waterproof covering, vented to prevent moisture buildup.

## **1.8 WARRANTIES**

- .1 Furnish manufacturer's 25 year commercial warranty providing coverage against checking, splitting, splintering, rotting, structural damage from termites, and fungal decay of wood composite.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

- .1 Acceptable Manufacturer:

- .1 TruNorth Composites, 490 Elgin St #3, Brantford, ON N3S 7P8

## **2.2 COMPOSITE WOOD FOR EXTERIOR FENCES:**

- .1 Acceptable Product:
  - .1 Composite wood: TruNorth Accuspan (Solid Core)
  - .2 Or equivalent.
    - .1 Colour: Ash Grey

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Do not begin installation until substrates have been properly prepared.
- .2 If substrate preparation is the responsibility of another installer, notify Consultant of unsatisfactory preparation before proceeding.

### **3.2 PREPARATION**

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### **3.3 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions.
- .2 Cut and drill wood composite using carbide tipped blades.
- .3 Space posts maximum as noted in Contract Documents.

### **3.4 CLEANING**

- .1 Clean wood composite to remove stains:
  - .1 Mold, mildew, and berry and leaf stains: Clean surfaces with conventional deck wash containing detergent or sodium hypochlorite.
  - .2 Rust and ground-in dirt: Clean surfaces with cleaner containing oxalic or phosphoric acid.
  - .3 Oil and grease: Clean surfaces with detergent containing degreasing agent.

### **3.5 PROTECTION**

- .1 Protect installed products until completion of project.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 DESCRIPTION**

- .1 This Section specifies the supply and installation of *Site* furnishings.

### **1.3 RELATED WORK**

- .1 Section 32 13 16 - Concrete Paving:

### **1.4 SUBMITTALS**

- .1 Submit detailed Shop Drawings of *Products* including overall dimensions and options for approval by the *Consultant*.
- .2 Submit samples of *Products* and/ or components upon request by the *Consultant*.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver *Products* to the *Site* in the manufacturer's original, unopened containers and packaging. Upon delivery, examine packages immediately to ensure all *Products* are complete and undamaged.
- .2 Store *Products* in a protected, dry area in manufacturer's unopened containers and packaging.
- .3 Protect *Product's* finish from damage during handling and installation.

### **1.6 COORDINATION**

- .1 Coordinate installation of *Site* furnishings with *Site* work and other appropriate Sections of the *Specifications* to maintain proper provisions of the work specified.
- .2 All *Site* furnishings shall be laid out in the field by the *Contractor* and approved by the *Consultant* prior to installation.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Bench:

- .1 Manufacturer: Maglin Site Furniture Inc.  
Model: MLB870-PC  
Colour: silver  
Slats: HDPC Charcoal  
Mounting: Surface mount to concrete pad

- .2 Or *Equivalent*

- .2 Picnic Table:

- .1 Manufacturer: Maglin Site Furniture Inc.  
Model: MTB-0210-00029  
Colour: Cedar  
Slats: HDPC Cedar

Mounting: Surface mount to concrete pad

.2 Or *Equivalent*

.3 Waste Receptacles:

.1 Manufacturer: Maglin Site Furniture Inc.  
Model: MTR-1400-00009  
Colour: Charcoal  
Mounting: Surface mount to concrete pad

.2 Or *Equivalent*

.4 Recycling Receptacles:

.1 Dual Stream:  
Manufacturer: Maglin Site Furniture Inc.  
Model: MRR-1400-00018  
Colour: Green  
Mounting: Surface mount to concrete pad

.2 Or *Equivalent*

.3 Triple Stream:  
Manufacturer: Maglin Site Furniture Inc.  
Model: MRR-1400-00020  
Colour: Green  
Mounting: Surface mount to concrete pad

.4 Or *Equivalent*

.4 Bike Rack:

.1 Manufacturer: Maglin Site Furniture Inc.  
Model: MBR-0400-00003  
Colour: Charcoal  
Mounting: Surface mount to concrete pad

.2 Or *Equivalent*

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- .1 Place *Site* furnishings for approval by the *Consultant* prior to installation.
- .2 Do not locate anchor bolts until *Site* furnishings are in place.
- .3 Surface mount *Site* furnishings to concrete pad or wall as per the *Drawings* and Details and/or the manufacturers' instructions and specifications.

**END OF SECTION**



## **PART 1 – GENERAL**

### **1.1 GENERAL REQUIREMENTS**

- .1 Read and be governed by conditions of the *Contract Documents*, including Sections of Division 01.

### **1.2 DESCRIPTION**

- .1 This Section specifies the layout, loading, hauling, spreading, rolling and fine grading of topsoil and planting bed mixture.

### **1.3 RELATED WORK**

- .1 Section 32 92 23 - Sodding
- .2 Section 32 93 00 – Trees, Shurbs, and Ground Cover Planting

### **1.4 SCOPE OF WORK**

- .1 Topsoil and finished grading shall be applied to all areas of the *Site* designated on the Contract Drawings to receive sodding and planting.

### **1.5 SOURCE QUALITY CONTROL**

- .1 Inspection and testing of topsoil will be carried out by a testing laboratory chosen and paid for by the *Contractor* and approved by the *Consultant*.
- .2 Acceptance of topsoil shall be subject to the soil analysis test results. Do not commence work until topsoil accepted by the *Consultant*.
- .3 Test topsoil for clay, sand and silt, N, P, K, Mg, soluble salt content, pH value, growth inhibitors and soil sterilants.
  - .1 Use 25 mm diameter sampling tube or spade to take a minimum of six samples. Mix samples together thoroughly before submitting for testing.
  - .2 Submit 0.5 kg sample of topsoil to testing laboratory and indicate present use, intended use, type of subsoil and quality of drainage. Prepare and ship sample in accordance with Ontario regulations and testing laboratory requirements.
  - .3 Determine required limestone treatment to bring pH value of soil 6.0 to 7.0 level.
  - .4 Submit two copies of soil analysis and recommendations for corrections to the *Consultant*.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Topsoil: Topsoil for fine grading shall conform to the following qualities: friable, neither heavy clay nor of very light sandy nature consisting of 45% sand, 35% silt, 20% clay and pH value of 6 - 7. Free from subsoil, roots, vegetation, debris, toxic materials, stones over 50 mm diameter.
- .2 On-Site Topsoil: Topsoil that is present on the *Site* can be re-used if it conforms to the above requirements and is approved by the *Consultant*.
- .3 Peat Moss:
  - .1 Derived from partially decomposed fibrous or cellular stems and leaves of species of sphagnum mosses.

- .2 Elastic and homogeneous, brown in colour.
- .3 Free of wood and deleterious material which could prohibit growth.
- .4 Shredded particle minimum size: 5mm.
- .4 Fertilizer:
  - .1 Complete commercial **organic** fertilizer.
  - .2 Bonemeal: finely ground with a minimum analysis of 20% phosphoric acid.
- .5 Bonemeal: Commercial raw bonemeal, finely ground, with minimum analysis of 2% nitrogen and 11% phosphoric acid.
- .6 Manure: well rotted, unbleached cattle manure, not less than eight months and not more than two years old, free of harmful chemicals and injurious substances, containing not more than 25% straw, leaves and other foreign matter.
- .7 Lime: agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve. Provide lime in the form of dolomitic limestone.
- .8 Aluminum Sulfate: Commercial grade, unadulterated.

### PART 3 - EXECUTION

#### 3.1 PREPARATION OF PLANTING BED MIXTURE

- .1 Thoroughly mix together five parts topsoil, two parts manure and one part peat moss. Shred to a fine, even texture.
- .2 Add bone meal at the rate of .58 kg per cubic metre and mix thoroughly.
- .3 Protect planting mixture to prevent deterioration.

#### 3.2 SPREADING AND FINE GRADING

- .1 Prepare and compact sub-grade.
- .2 Have sub-grade approved by the *Consultant* prior to commencing topsoil placement.
- .3 Scarify sub-grade surface to a minimum depth of 75mm to facilitate bonding.
- .4 Do not spread topsoil/ planting bed mixture when it is frozen or wet.
- .5 Remove and dispose of all stones, sticks, sub-soil, lumps or other debris in excess of 50mm diameter and all surface litter and live weeds.
- .6 Spread soil to the following minimum depths:
  - 150mm topsoil in areas to be sodded
  - 450mm planting bed mixture in planting beds
- .7 Maintain soil 15mm below top of curb, finished grades of pavement, etc., to allow for sodding.
- .8 Manually spread topsoil around existing trees and shrubs.

- .9 Fine grade topsoil/ planting bed mixture to eliminate rough and low areas to ensure positive surface drainage, blend smoothly with adjacent finished grade elevations and conform to the specified levels and profiles.
- .10 Grade swales and ditches evenly to ensure positive runoff to drainage inlets, without ponding and with smoothly rounded, uniform side slopes.
- .11 Roll topsoil surface of all areas to be seeded or sodded to produce a smooth, uniform surface that is firm against deep foot prints and with a fine, loose texture.
- .12 Have finished surfaces inspected by the *Consultant* before placing seed or sod.
- .13 Dispose of surplus materials and debris off the *Site* and clean up soil from all paved surfaces. The *Contractor* shall ensure compliance with the On-Site and Excess Soil Management regulation made under the *Environmental Protection Act*, RSO 1990, c E.19 (O. Reg. 406/19). Refer to SC 5 of the Supplementary Conditions for further requirements.

### **3.3 SOIL AMENDMENTS**

- .1 Apply soil amendments at rate as specified in the *Contract Documents* and as determined from soil sample test.
- .2 Mix soil amendments into full depth of topsoil prior to application of fertilizer.

### **3.4 APPLICATION OF FERTILIZER**

- .1 Spread fertilizer uniformly over entire area of topsoil at rate determined on basis of soil sample test.
- .2 Mix fertilizer thoroughly to full depth of topsoil.

### **3.5 SURPLUS MATERIAL**

- .1 Dispose of materials not required at an appropriate off-*Site* facility in accordance with O. Reg. 406/19 and SC 5 of the Supplementary Conditions.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 DESCRIPTION**

- .1 This Section specifies the installation of sod.

### **1.3 RELATED WORK**

- .1 Section 32 91 19- - Topsoil Placement and Grading:

### **1.4 QUALITY ASSURANCE**

- .1 The *Contractor* shall engage an experienced installer with a minimum of five years' experience on comparable projects.
- .2 The *Contractor* shall ensure that the installer maintains an experienced full-time supervisor on the *Site* during times that landscaping is in progress.

### **1.5 ACCEPTANCE**

- .1 Sodded areas will be accepted at the date of *Substantial Performance of the Work* provided that:
  - .1 Sodded areas are properly established and in a vigorous growing condition.
  - .2 Sod is free of bare and dead spots and without weeds.
  - .3 No surface soil visible when grass has been cut to height of 50mm.
  - .4 Sodded areas have been cut twice.
- .2 Lawns sodded in fall will be accepted the following spring, one month after start of growing season, provided that the conditions of subsection 1.4 are fulfilled.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Topsoil: see section 32 91 19-- Topsoil Placement and Grading
- .2 Imported Topsoil: see section 32 91 19.-Topsoil Placement and Grading
- .3 Grass Sod: Shall be a certified No. 1 Grade Turfgrass Nursery Sod, as per Green Horizons Group Eco Solutions: Bluegrass/ Fescue Blend (or *Equivalent*), grown and sold in accordance with the classification of the Nursery Sod Growers Association of Ontario. At time of sale shall have a strong, fibrous root system and shall be free from stones and burned or bare spots.
- .4 Fertilizer: Organic fertilizer as per the soil analysis report provided by the *Contractor* (refer to Section 32 91 19 - Topsoil Placement and Grading). The *Contractor* shall be prepared to *Supply* all necessary fertilizers, to eliminate any chemical deficiencies as indicated by the soil analysis report of imported topsoil.
- .5 Wooden Pegs: Sod on steep slopes shall be secured with hardwood pegs, 225mm long minimum and approximately 25mm x 25mm square, or *Equivalent*. Pegs shall be of sufficient length to ensure satisfactory anchorage of the sod.
- .6 Water: Potable, free of impurities.

## **PART 3 - EXECUTION**

### **3.1 CUTTING, HANDLING AND STORAGE**

- .1 Sod shall be cut by approved methods in accordance with recommendations of the Nursery Sod Growers Association of Ontario or equivalent association acceptable to the *Consultant*.
- .2 Sod shall be rolled or folded prior to lifting in such a manner as to prevent tearing or breaking.
- .3 Sod shall be protected during transportation to prevent drying out and shall arrive at the *Site* in a fresh and healthy condition.
- .4 Sod shall be installed immediately after arrival. If there is any delay in installation the sod shall be kept moist and cool at all times until installation.
- .5 All commercial fertilizer shall be packed in standard containers, clearly marked with the name of the manufacturer, weight and analysis.
- .6 Fertilizer shall be stored in a weatherproof storage place and in such a manner that it will stay dry and its effectiveness is not impaired.

### **3.2 INSTALLATION**

- .1 All rough grading, filling, spreading of topsoil and fine grading and other preparation work required, shall be executed and completed as described in the appropriate Sections of this Contract.
- .2 The specified fertilizer shall be applied to and well worked into the topsoil by discing, raking or harrowing, at the rate specified in the application manual. This shall be done 48 hours before laying sod.
- .3 The finished surface shall be smooth, firm against footprints, with a fine, loose texture before sod is placed.
- .4 Sodding operations shall take place during suitable weather conditions and on ground which is free from frost, snow and water. Sod shall be laid as soon as possible after delivery to prevent deterioration. Sod shall be laid closely knit together in such a manner that no open joints are visible, or pieces are overlapping. Sod shall be laid smooth and flush with adjoining grass areas and paving and top surface of curbs unless shown otherwise on the *Drawings*.
- .5 On any slopes of 3:1 and steeper, sod shall be laid perpendicular to the slope, and every row shall be pegged with wooden pegs at intervals of not more than 600mm. Pegs shall be driven flush with sod. For drainage swales place 5 pegs per square metre.
- .6 After installation of sod, the area shall be watered immediately with sufficient amounts to saturate the sod and upper 100mm of soil.
- .7 After sod and soil have dried sufficiently to prevent damage, the area shall be rolled with a roller providing 7325kg/m<sup>2</sup> pressure (1500 lbs./ft<sup>2</sup>), to ensure a good bond between sod and soil and to remove minor depressions and irregularities.
- .8 Protect all newly laid sod areas until vigorous, hardy, even growth is established to a growth height of 80mm.

### **3.3 MAINTENANCE**

- .1 Maintenance for sodded areas shall begin immediately after sod has been installed and shall continue until the date of Acceptance by the Consultant.

- .2 Maintenance shall include all measures necessary to establish and maintain sod in a vigorous growing condition, including but not limited to:
  - .1 Mowing: Shall be at regular intervals as required, to maintain grass at a maximum height of 65mm. Not more than 1/3 of blade shall be cut at any one mowing. Edges of sodded areas shall be neatly trimmed and hand clipped where necessary. Heavy clippings shall be removed immediately after mowing and trimming.
  - .2 Watering: Shall be carried out when required and with sufficient quantities to prevent grass and underlying soil from drying out.
  - .3 Rolling: Shall be carried out when required to remove any minor depressions or irregularities.
  - .4 Weed control: Shall be carried out when required. When herbicides are used they shall be applied in accordance with manufacturer's recommendations. Any damage resulting from the *Contractor's* use of herbicides shall be remedied at the *Contractor's* expense.
  - .5 Erosion: Erosion occurring as a result of faulty workmanship and/or materials on the part of the *Contractor* shall be repaired at the *Contractor's* expense.
- .3 Any sodded areas which show deterioration or bare spots shall be repaired immediately by the *Contractor*.

**END OF SECTION**

## PART 1 – GENERAL

### 1.1 GENERAL INSTRUCTIONS

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### 1.2 DESCRIPTION

- .1 This Section specifies the supply and planting of trees, shrubs and ground covers.

### 1.3 RELATED WORK

- .1 Section 32 91 19- Topsoil Placement and Grading

### 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 *Supply* manufactured items in standard containers, with contents, weight, component analysis, and the name of the manufacturer clearly indicated.
- .2 Store manufactured materials which are subject to deterioration in a weatherproof place on *Site* in such a manner that their effectiveness is not impaired.
- .3 Do not plant material on which the rootball has been cracked or broken preparatory to or during the planting process.
- .4 Provide rootballs of the following minimum sizes corresponding to tree size.

<u>Caliper</u>	<u>Height</u>	<u>Root Ball</u>
<u>Deciduous Trees</u>	<u>Coniferous Tree</u>	<u>Diameter</u>
-	1.75 m	60 cm
50 mm	2.00 m	70 cm
60-70 mm	2.25-2.5 m	80 cm
80-90 mm	2.75-3.0 m	90 cm
100 mm	-	1.00 m
125 mm	-	1.50 m

- .5 Provide a root ball depth of a minimum 60 per cent of diameter.
- .6 Cut all roots cleanly when digging plants. Split roots are not acceptable. Cut roots even with the edges of the rootball. Paint all cut roots over 13mm diameter with approved tree wound dressing.
- .7 Protect all plant material from damage and breakage. Protect all parts of the plant material from drying out from the time of digging until they are installed.

### 1.5 SUBSTITUTIONS

- .1 *Supply* and *Install* plant material as specified on the plant list in the Contract Drawings. Substitutions of other plant material will **not** be allowed unless approved in writing by the *Consultant*.

### 1.6 INSPECTIONS

- .1 Give 48 hours' notice for inspection of plant material and the stakeout of planting locations by the *Consultant*.
- .2 Partial acceptance will be given when planting would not be in accordance with best horticultural practices. If partial acceptance is desired, give notice to the *Consultant* in writing.

- .3 Final inspection of all plant material will be made at the end of the specified warranty period. All plants must be in a healthy growing condition at the time of this inspection.

## 1.7 WARRANTY

- .1 During the warranty period, replace all material that is dead or not in a satisfactory, healthy growing state or which does not meet the requirements of the *Specifications*, at no extra cost to the *Owner*.
- .2 All replacements must be plants of the same size and species as shown on the plant list, supplied and planted in accordance with the *Drawings* and *Specifications*.

## PART 2 - PRODUCTS

### 2.1 PLANT MATERIAL

- .1 All plant material must be nursery grown and meet the specifications set out in the latest Guide Specifications for Nursery Stock prepared by the Canadian Nursery Trade Association (C.N.T.A.) or equivalent association acceptable to the *Consultant* for size, height, spread, grading, quality and method of cultivation.
- .2 Nomenclature of specified plants shall conform to the International Code of Nomenclature for Cultivated Plants and the latest edition of Standardized Plant Names.
- .3 Plant Material shall be true to name and type, structurally sound, well branched; healthy and vigorous and free from disease, insect infestations and damage, and shall be densely foliated with a healthy, well developed root system. Pruning wounds must show vigorous bark on all edges and all parts must show live and green cambium tissue when cut.
- .4 All material must conform to the sizes shown on the plant list, except that larger material may be used when approved by the *Owner*. No extra will be paid for use of larger plants.
- .5 Plant material sizes must conform to the following standards:
  - .1 caliper - diameter of the trunk measured 150mm above the normal grade around the plant.
  - .2 height - measured from the normal grade around the plant to the top of the main foliage mass.
  - .3 spread - the diameter of the main foliage mass, as its widest point.

### 2.2 OTHER MATERIALS

- .1 Topsoil: see Section Section 32 91 19- - Topsoil Placement and Grading
- .2 Planting Bed Mixture: see Section Section 32 91 19 - Topsoil Placement and Grading
- .3 Peat moss: partially decomposed fibrous form of cellular stems and leaves of sphagnum moss, free of woody substance and harmful mineral matter, having a pH range of 4.5 to 6.0.
- .4 Tree Wrap: 225g burlap supplied in strips 150mm minimum to 250mm maximum width or heavy, waterproof crepe paper 100mm to 150mm wide.
- .5 Anchor stakes: 50x50x3000mm spruce stakes
- .6 Rodent/ Trimmer Protection: Big 'O' drain tile 100mm dia. x 450mm long or equivalent



- .7 Landscape Fabric: Commercial grade Weed-X by Dalen Products Inc. or *Equivalent*.
- .8 Hemp Rope: 15mm diameter.
- .9 Mulch: Gro-bark SPM or *Equivalent*.

## **PART 3 - execution**

### **3.1 PREPARATION**

- .1 Apply planting bed mixture to minimum 450mm depth for shrub beds and ground covers.

### **3.2 INSTALLATION**

- .1 Ensure all planting excavations are 150mm greater on all sides than the width of the rootball. **Do not leave tree pits open overnight.**
- .2 Place plant plumb in the centre of the planting pit with a minimum of 150mm of compacted planting soil mixture under the rootball. Face the plant to give the best appearance or relationship to adjacent structures. Cut away all ropes from the root ball at the base of tree.
- .3 Backfill with planting soil in 150mm layers and firmly tamp each layer to ensure the plant stays plumb. Ensure no air pockets remain around the roots.
- .4 Water thoroughly when hole is ½ full of tamped soil mixture, and again when the operation is complete.
- .5 Except for plants in planting beds, construct an earth saucer around each plant equal to the diameter of the rootball and 50mm minimum depth to retain water around the roots.
- .6 Cover all exposed soil with a 50mm minimum depth of shredded wood bark mulch.
- .7 Wrap all trees over 50mm calliper. Apply wrapping in a spiral manner from grade to above the second branch. Secure wrapping with suitable cord.
- .8 Secure all trees as outlined in the Contract *Drawings*.
- .9 Prune plants to remove dead or broken branches. Do not cut a leader. Use only clean and sharp tools.

### **3.3 CLEAN-UP**

- .1 At the completion of planting operations, remove all surplus material from the *Site* at no extra cost to the *Owner*.
- .2 Make good all damage resulting from planting operations at no extra cost to the *Owner*.

### **3.4 MAINTENANCE PRIOR TO SUBSTANTIAL PERFORMANCE OF THE WORK**

- .1 The *Contractor* shall be responsible for maintenance of plant material up to the point of *Substantial Performance of the Work*, and such maintenance shall be considered as part of the installation work.
- .2 Maintenance shall include all measures necessary to establish and maintain all plants in a vigorous and healthy growing condition, including but not limited to:
  - .1 Watering: Water as required to maintain sufficient soil moisture content.
  - .2 Weeding: Weed planting beds and tree pits.
  - .3 Cultivating: Cultivate planting beds and tree pits.
  - .4 Pruning: Prune all dead or broken wood from trees and shrubs.
  - .5 Pest control: Employ disease and insect/rodent control measures (chemical and/or mechanical) when required. Use chemical methods in accordance with the manufacturer's directions. Make good any damage resulting from improper use of pesticides at no extra cost to the *Owner*.
  - .6 Accessories: Keep all accessories in good condition and properly adjusted. Reset plants to proper grades or upright position and adjusting tree guards and guy wires (if used) as required.
- .3 At the time of *Substantial Performance of the Work*, all material must be in a healthy vigorous growing condition. Beds and tree pits must be freshly cultivated and free of weeds, rubbish, or debris.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

### **1.2 RELATED WORK**

- |  |                  |
|--|------------------|
| .1 Site Grading                          | Section 31 23 13 |
| .2 Excavating, Trenching and Backfilling | Section 31 23 10 |
| .3 Storm Sewers                          | Section 33 44 00 |
| .4 Aggregates: General                   | Section 31 05 17 |

### **1.3 REFERENCES**

- .1 ASTM A48/A48M-03 (2016), Specification for Gray Iron Castings.
- .2 ASTM C139-18 (1989), Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
- .3 ASTM C478M-90, Specification for Precast Reinforced Concrete Manhole Sections
- .4 CSA A3000, Portland Cement.
- .5 CSA A3000, Masonry Cement.
- .6 CAN/CSA-A23.1-M90, Concrete Materials and Methods for Concrete Construction.
- .7 CSA A82.56-M1976, Aggregate for Masonry Mortar.
- .8 CAN3-A165 Series-M85, CSA Standards on Concrete Masonry Units.
- .9 CAN/CSA-G30.18-M92, Billet Steel Bars for Concrete Reinforcement.
- .10 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .11 Ontario Provincial Standard Specification 407.

## **PART 2 – PRODUCTS**

### **2.1 MATERIALS**

- .1 Precast manhole units: to ASTM C478M, circular or oval. Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation. Monolithic bases to be approved by Consultant and set on concrete slabs cast in place.
  - .1 1200 mm diameter manhole as per OPSD 701.010.
- .2 Precast catch basins: to ASTM C478M.
  - .1 Catch basins as per OPSD 705.010

- .3 Joints: to be made watertight using rubber rings or cement mortar.
- .4 Mortar:
  - .1 Aggregate: to CSA A82.56.
  - .2 Cement: to CAN/CSA-A8.
- .5 Ladder rungs: to CAN/CSA-G30.18, No. 25M billet steel deformed bars, hot dipped galvanized to CAN/CSA G164 Rungs to be safety pattern (drop step type).
- .6 Adjusting rings: to ASTM C478M.
- .7 Concrete Brick: to CAN3-A165 Series.
- .8 Frames, gratings, covers to dimensions as indicated and following requirements:
  - .1 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment.
  - .2 Gray iron castings: to ASTM A48, strength class 30B.
  - .3 Castings: coated with two applications of asphalt varnish.
  - .4 Storm manhole frames and covers: heavy duty municipal type for road service. Cover cast without perforations and complete with two 25 mm square lifting holes, as per OPSD 400.010, unless otherwise specified.
  - .5 Catchbasin frame and cover: as per OPSD 400.010.
  - .6 Manhole frame and cover as per OPSD 401.010.
- .9 Granular bedding and backfill: Granular B Type I: to OPSD 1010 and Section 02701 – Aggregates: General and to Section 02315 – Excavating, Trenching and Backfilling.
- .10 Unshrinkable fill: to Section 02315 – Excavating, Trenching and Backfilling.

### **PART 3 – EXECUTION**

#### **3.1 EXCAVATION AND BACKFILL**

- .1 Excavate and backfill in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.
- .2 Obtain approval of Consultant before installing manholes or catch basins.

#### **3.2 INSTALLATION**

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying will be allowed.
- .3 Dewater excavation free of standing water or as directed by Consultant and remove soft and foreign material before placing concrete base.
- .4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% Corrected Maximum Dry Density.

- .5 Precast units.
  - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight with rubber ring gaskets, cement mortar, or combination thereof.
  - .2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
  - .3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .6 For sewers:
  - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
  - .2 Bench to provide a smooth U-shaped channel in manholes.
- .7 Compact granular backfill to 98% Corrected Maximum Dry Density.
- .8 Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.
- .9 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

### **3.3 LEAKAGE TEST**

- .1 Visual inspection of leakage will be carried out. If any leakage is observed, correct leakage as directed by Consultant at no additional cost.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

### **1.2 DESCRIPTION**

- .1 The work included in this Section includes for all labour, equipment and materials required for the watermain construction within the site, and watermain construction within the municipal right of way connecting to existing municipal servicing.
- .2 Included in the work is coordination and cooperation with Municipal forces as required to complete the work including providing temporary blow offs, isolation valves, pressure testing and chlorination as required by Municipal forces.

### **1.3 RELATED WORK**

- .1 Excavating, Trenching and Backfilling Section 31 23 10

### **1.4 REFERENCES**

- .1 The Municipality Standards and Specifications for watermain construction.

### **1.5 SCHEDULING OF WORK**

- .1 Schedule work to minimize interruptions to existing services.

## **PART 2 – PRODUCTS**

- .1 All products utilized within the water system to comply with the Municipality Standards and Specifications.

## **PART 3 – EXECUTION**

### **3.1 PREPARATION**

- .1 Clean pipes, fittings, and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects to approval of Consultant. Remove defective materials from site as directed by Consultant.

### **3.2 TRENCHING**

- .1 Do trenching work in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling.
- .2 Trench depth to provide cover over pipe of not less than 2.0 metres from finished grade or as indicated.
- .3 Trench alignment and depth require Consultants' approval 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 of 300 mm below bottom of pipe or 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.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to at least 95% of corrected maximum dry density.
- .6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 10 – Excavating, Trenching and Backfilling with compacted bedding material.

### 3.4 PIPE INSTALLATION

- .1 Lay pipes to ANSI/AWWA C600 Manual of Practice and manufacturer's standard instructions and specifications. Do not use blocks except as permitted in 3.3.2.
- .2 Join pipes in accordance with ANSI/AWWA C600, ANSI/AWWA C206, AWWA Manual of Practice and manufacturer's recommendations.
- .3 Bevel or taper ends of PVC pipe to match fittings.
- .4 Handle pipe by methods approved by Engineer recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .5 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Take up and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
- .6 Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater, face socket ends upgrade.
- .7 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.
- .8 Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .9 Position and join pipes with equipment and methods approved by Consultant.
- .10 Cut pipes in an 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.
- .11 Align pipes carefully before jointing.
- .12 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.
- .13 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.
- .14 Complete each joint before laying next length of pipe.

- .15 Minimize deflection after joint has been made.
- .16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .17 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by the Consultant.
- .18 Provide necessary fittings and adaptors as required between existing watermain pipe materials and proposed watermain pipe materials.
- .19 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .20 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .21 Do not lay pipe on frozen bedding.
- .22 Contractor responsible for satisfactory completion of hydrostatic and leakage testing to Consultant's approval. Contractor also responsible for degree of backfilling complete prior to hydrostatic and leakage testing as well as isolation and correction of any leaks resulting in failed tests.
- .23 Backfill remainder of trench.

### **3.5 CATHODIC PROTECTION AND TRACER WIRE**

- .1 ALL mechanical restraint systems shall be installed with cathodic protection complete with 12-gauge tracer wire along the top of Polyvinyl Chloride (PVC) and concrete Pressure Pipe (CPP).

### **3.6 HYDROSTATIC AND LEAKAGE**

- .1 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described as required by the Municipality standards.
- .2 Notify Consultant at least 24 h in advance of all proposed tests. Perform tests in presence of Consultant.
- .3 Where any 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.
- .4 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Consultant.
- .5 Upon completion of pipe laying and after Consultant has inspected work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated or directed by Consultant.
- .6 Leave hydrants, valves, backflow preventer, water meter, joints and fittings exposed.
- .7 When testing is done during freezing weather, protect hydrants, valves, backflow preventer, water meter, joints and fittings from freezing.
- .8 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- .9 Open valves.



- .10 Expel air from main by slowly filling main with potable water. Install corporation stops at high points in main where no air-vacuum release valves are installed. Remove stops after satisfactory completion of test and seal holes with plugs.
- .11 Thoroughly examine exposed parts and correct for leakage as necessary.
- .12 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.
- .13 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .14 Repeat hydrostatic test until all defects have been corrected.
- .15 Apply a leakage test pressure of equal to design pressure after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for period of 2 h.
- .16 Define leakage as amount of water supplied from water meter in order to maintain test pressure for 2 h.
- .17 Do not exceed allowable leakage of 0.03 L/mm diameter per 300 m of pipe, including lateral connections, per hour.
- .18 Locate and repair defects if leakage is greater than amount specified.
- .19 Repeat test until leakage is within specified allowance for full length of water main.

### **3.7 PIPE SURROUND**

- .1 Upon completion of pipe laying and after Consultant has inspected work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 5 m of pipe.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95% of SPMDD to ASTM D698.
- .6 Compact each layer from (mid height) of pipe to underside of backfill to at least 95% of SPMDD and in accordance with Geotechnical Report for site.

### **3.8 BACKFILL**

- .1 Place backfill material above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.
- .3 Compact native backfill to at least 95% of SPMDD.

### **3.9 FLUSHING AND DISINFECTING**

- .1 The Municipality shall perform all chlorination works.

- .2 Flush water mains through available outlets with a sufficient flow of potable water to produce a velocity of 1.5 m/s, within pipe for 10 min., or until foreign materials have been removed and flushed water is clear.
- .3 Flushing flows shall be as follows:

<u>Pipe Size NPS</u>	<u>Flow (L/s) Minimum</u>
6 and below	38
8	75

- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 Complete flushing to satisfaction of Consultant and The Municipal forces.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda for all work, including work outside the property line including work within Regional and Municipal right of way unless otherwise noted.

### **1.2 RELATED WORK**

- |  |                  |
|--|------------------|
| .1 Site Grading                          | Section 31 23 13 |
| .2 Excavating, Trenching and Backfilling | Section 31 23 10 |
| .3 Manholes and Catchbasins              | Section 33 05 14 |
| .4 Aggregates: General                   | Section 31 05 17 |

### **1.3 REFERENCES**

- .1 ASTM D3034, Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and fittings.
- .2 CAN/CSA-B182.2, PVC Sewer Pipe and Fittings (PSM Type),
- .3 CAN/CSA-B182.11, Recommended Practice for the Installation of Plastic Crain and Sewer Pipe and Pipe Fittings.
- .4 Ontario Provincial Standard Specification MUNI 410.

### **1.4 MATERIAL CERTIFICATION**

- .1 Submit manufacturer's test data and certification at least 2 weeks prior to commencing work.
- .2 Certification to be marked on pipe.

### **1.5 SCHEDULING OF WORK**

- .1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

## **PART 2 – PRODUCTS**

### **2.1 PVC PIPE**

- .1 Poly Vinyl Chloride pipe as specified in the Contract Drawings shall be in accordance with OPSS 410, Pipe Sewer Installation in Open Cut.

### **2.2 PIPE BEDDING, SURROUND AND COVER MATERIALS**

- .1 Granular embedment materials to Section 31 05 17 – Aggregates.

## **2.3 BACKFILL MATERIAL**

- .1 Backfill to Section 31 23 10 – Excavation, Trenching and Backfilling
- .2 Backfill within the public right of way to be un-shrinkable fill.

## **2.4 JOINT MORTAR**

- .1 Portland cement: to CAN/CSA-A5, normal type 10.
- .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 additive..

## **PART 3 – EXECUTION**

### **3.1 PREPARATION**

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site.

### **3.2 TRENCHING**

- .1 Do trenching work in accordance with Section 31 23 10 – 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 approval of Consultant prior to placing bedding material and pipe.

### **3.3 GRANULAR BEDDING**

- .1 Place granular bedding material to details indicated in bedding detail OPSD 802.010 to OPSD 802.054, depending on type of soil and pipe. Use Class B bedding and place bedding in unfrozen condition. Type of soil to be defined in the field as Type 1, 2, 3, or 4 as per Health and Safety Act and Regulations for Construction Projects.
- .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.
- .3 Compact each layer full width of bed to at least 95% corrected maximum dry density.
- .4 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.
- .5 Shape transverse depressions as required to suit joints.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted common backfill.

### **3.4 INSTALLATION OF SANITARY SEWER PIPES**

- .1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Consultant.
- .2 Handle pipe using methods approved by Consultant. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

- .3 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .4 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .5 Do not allow water to flow through pipes during construction except as may be permitted by Consultant.
- .6 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .7 PVC Pipe as specified in the Contract Drawings shall be installed in accordance with OPSS MUNI 410, Pipe Sewer Installation in Open Cut.
- .8 When any stoppage of work occurs, restrain pipes as directed by Consultant, to prevent "creep" during down time.
- .9 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.
- .10 Make watertight connections to manholes and catch basins. Use shrinkage compensating grout when suitable gaskets are not available. Support connections as per OPSD 708.020.
- .11 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes. Joint to be structurally sound and watertight.
- .12 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 has inspected pipe joints, surround and cover pipes as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Pipe surround material to extend 300 mm above crown 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 95% corrected maximum dry density.

### **3.6 BACKFILL**

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

### **3.7 FIELD TESTING**

- .1 Repair or replace pipe, pipe joint or bedding found defective.

- .2 When directed by Consultant, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda.

### **1.2 RELATED WORK**

- |  |                  |
|--|------------------|
| .1 Excavating, Trenching and Backfilling | Section 31 23 10 |
| .2 Manholes and Catchbasins              | Section 33 05 14 |
| .3 Aggregates: General                   | Section 31 05 17 |

### **1.3 REFERENCES**

- .1 ASTM C14, Specification for Concrete Sewer, Storm Drain and Culvert Pipe.
- .2 ASTM C76, Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
- .3 ASTM C443M-85a (1990), Specification for Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets.
- .4 CSA A3000, Portland Cement.
- .5 CAN/CSA-A257, Series M92, Standards for Concrete Pipe.
- .6 CAN3-G401-M81, Corrugated Steel Pipe products.
- .7 Ontario Provincial Standard Specification MUNI 410.

### **1.4 MATERIAL CERTIFICATION**

- .1 Certification to be marked on pipe.

### **1.5 SCHEDULING OF WORK**

- .1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

## **PART 2 – PRODUCTS**

### **2.1 CONCRETE PIPE**

- .1 Non-reinforced circular concrete pipe and fittings: to CAN/CSA-A-257-2, ASTM C14M, Class 3 designed for flexible rubber gasket joints to ASTM C443 M and CAN/CSA A257.
- .2 Reinforced circular concrete pipe and fittings: to CAN/CSA-A257, ASTM C76M, strength classification as indicated in the Contract Drawings, designed for flexible rubber gasket joints to ASTM C443M and CAN/CSA A257.
- .3 Manufactured tees for pipe-to-pipe connections.

.4 Lifting holes:

- .1 Pipe 900 mm and less diameter: no lift holes.
- .2 Pipe greater than 900 mm diameter: lift holes not to exceed two in piece of pipe.
- .3 Provide pre-fabricated plugs to effectively seal lift holes after installation of pipe.

## **2.2 PVC PIPE**

- .1 Poly Vinyl Chloride pipe as specified in the Contract Drawings shall be in accordance with OPSS MUNI 410, Pipe Sewer Installation in Open Cut.

## **2.3 TRENCH DRAINS**

- .1 Trench drains as specified in the Contract Drawings shall be in accordance with manufacturers requirements.

## **2.4 PIPE EMBEDMENT, SURROUND AND COVER MATERIALS**

- .1 Granular material to Section 31 05 17 – Aggregates.
- .2 Granular A to Section 31 23 13 – Site Grading
- .3 Pipe embedment shall be in accordance with OPSD 802.010

## **2.5 BACKFILL MATERIAL**

- .1 Backfill shall be granular material as specified in Section 31 23 10 – Excavation, Trenching and Backfilling.

## **2.6 JOINT MORTAR**

- .1 Portland cement: to CAN/CSA-A5, normal type 10.
- .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.

### **3.2 TRENCHING**

- .1 Do trenching work in accordance with Section 31 23 10 – 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 approval of Consultant prior to placing bedding material and pipe.



### 3.3 GRANULAR BEDDING

- .1 Place granular bedding material to details indicated in bedding detail OPSD 802.010 to OPSD 802.054, depending on type of soil and pipe. Use Class B bedding and place bedding in unfrozen condition.
  - .1 Type of soil to be defined in the field as Type 1, 2, 3, or 4 as per Health and Safety Act and Regulations for Construction Projects.
- .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness.
- .3 Compact each layer full width of bed to at least 95% corrected maximum dry density.
- .4 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe. Do not use blocks when bedding pipes.
- .5 Shape transverse depressions as required to suit joints.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted granular backfill.

### 3.4 INSTALLATION OF STORM DRAINAGE PIPES

- .1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Consultant.
- .2 Handle pipe using methods approved by Consultant. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .4 Do not exceed maximum joint deflection recommended by pipe manufacturer.
- .5 Do not allow water to flow through pipes during construction except as may be permitted by Consultant.
- .6 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .7 Joints
  - .1 Poly Vinyl Chloride Pipe
    - .1 PVC Pipe as specified in the Contract Drawings shall be installed in accordance with OPSS MUNI 410, Pipe Sewer Installation in Open Cut.
- .8 When any stoppage of work occurs, restrain pipes as directed by Consultant, to prevent "creep" during down time.
- .9 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.
- .10 Make watertight connections to manholes and catch basins. Use shrinkage compensating grout when suitable gaskets are not available. Support connections as per OPSD 708.020.

- .11 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes. Joint to be structurally sound and watertight.
- .12 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 has inspected pipe joints, surround and cover pipes as indicated.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Pipe surround material to extend 300 mm above crown 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 95% corrected maximum dry density.

### **3.6 BACKFILL**

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Trench backfill shall be imported granular material consisting of Granular B Type I, or reclaimed granulars free of organics.
- .4 Trench backfill within the public right of way is to be un-shrinkable fill.

### **3.7 FIELD TESTING**

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Consultant, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.
- .2 Conform to the requirements stated in the General Conditions, Supplementary General Conditions of this Specification and all addenda.

### **1.2 RELATED WORK**

- |  |                  |
|--|------------------|
| .1 Excavating, Trenching and Backfilling | Section 31 23 10 |
| .2 Aggregates: General                   | Section 31 05 17 |

### **1.3 REFERENCES**

- .1 OPSS 1801 – Corrugated Steel Pipe Products
- .2 OPSS 1840 – Polyethylene Pipe Products
- .3 OPSS 1860 – Geotextiles
- .4 CSA G164-M1981 – Hot Dip Galvanizing of Irregularly Shaped Articles.
- .5 CGSB 41-GP-29Ma-1983 - Tubing, Plastic, Corrugated, Drainage

### **1.4 MATERIAL CERTIFICATION**

- .1 Certification to be marked on pipe.

### **1.5 SCHEDULING OF WORK**

- .1 Schedule work to minimize interruptions to existing services and to maintain existing flow during construction.

## **PART 2 – PRODUCTS.**

### **2.1 PVC PIPE**

- .1 Poly Vinyl Chloride pipe as specified in the Contract Drawings shall be in accordance with OPSS 410, Pipe Sewer Installation in Open Cut.

### **2.2 PIPE EMBEDMENT, SURROUND AND COVER MATERIALS**

- .1 Granular material to Section 31 05 17 – Aggregates.
- .2 Pipe embedment shall be in accordance with OPSD 802.010

### **2.3 BACKFILL MATERIAL**

- .1 Backfill shall be granular material as specified in Section 31 23 10 – Excavation, Trenching and Backfilling.

## **PART 3 – EXECUTION**

### **3.1 PREPARATION**

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site.

### **3.2 TRENCHING**

- .1 Do trenching work in accordance with Section 31 23 10 – 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 approval of Consultant prior to placing bedding material and pipe.

### **3.3 GRANULAR PIPE SURROUND**

- .1 Granular materials surrounding the pipe shall be in accordance with OPSS MUNI 1010.

### **3.4 INSTALLATION OF SUBDRAINS**

- .1 Installation of subdrains is to be in accordance with OPSS MUNI 405.

### **3.5 PIPE SURROUND**

- .1 Place surround material in unfrozen condition.
- .2 Pipe surround material shall be HL-8 Coarse Bedding Stone

### **3.6 BACKFILL**

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Trench backfill shall be imported granular material consisting of Granular B Type I, or reclaimed granulars free of organics.
- .4 Trench backfill within the public right of way is to be un-shrinkable fill.

**END OF SECTION**

## **PART 1 – GENERAL**

### **1.1 GENERAL INSTRUCTIONS**

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 1.

### **1.2 SECTION INCLUDES**

- .1 1.1 General Instructions
- .2 1.2 Section Includes
- .3 1.3 Summary
- .4 1.4 Submittals
- .5 1.5 Closeout Submittals
- .6 1.6 Quality Assurance
- .7 1.7 Extended Warranty
- .8 2.1 Materials
- .9 3.1 Examination
- .10 3.2 Installation
- .11 3.3 Cleaning
- .12 3.4 Protection

### **1.3 SUMMARY**

- .1 Section includes:
  - .1 *Supply* and installation of precast trench drain systems in the vehicle bays where indicated in the *Contract Documents*.
  - .2 Coordination with Divisions 21, 22 and 23 and the mechanical *Drawings* to ensure the proper connections are made to the sanitary drain system.

### **1.4 SUBMITTALS**

- .1 Submit required submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 *Product* data sheets:
  - .1 Submit manufacturer's *Product* data sheets for *Products* proposed for use in the work of this Section.
- .3 *Shop Drawings*:
  - .1 Submit *Shop Drawings* showing layout, profiles, product components, base material, surface finish (inside and out), hardware, and attachment and anchorage devices.
  - .2 *Shop Drawings* shall indicate field measurements taken at the *Place of the Work* prior to fabrication.

### **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit closeout submittals in accordance with Section 01 77 00 – Contract Closeout Procedures and Submittals.

.2 Operation and maintenance data:

- .1 Submit manufacturer's operation and maintenance instructions for inclusion in the operation and maintenance manuals.

.3 Maintenance materials:

- .1 Submit special tools required for accessing, assembly/disassembly, maintenance or removal of precast trench drain systems.

## 1.6 QUALITY ASSURANCE

.1 Qualifications:

- .1 Installers / applicators / erectors: The *Contractor* shall *Provide* work of this Section, executed by competent installers with a minimum of five years' experience in application of *Products*, systems and assemblies specified, and with approval and training of *Product* manufacturers.

## 1.7 EXTENDED WARRANTY

- .1 The *Contractor* shall warrant work of this Section in accordance with Section 01 78 36 -Warranties for a period of two years and as specified in Article A-15 – Warranty Period of the Agreement Between *Owner* and *Contractor*.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- .1 Trench drains to be Northstar Industries 'ULMA – Linear Trench Drain – Type Multi V+200', tel: 1-800-871-4547, or *Equivalent*, and to the following specifications:
- .1 Channel body polymer concrete in 1000 (39 3/8") lengths, with built-in cast iron black coated steel rail. Stepped system with Rapidlock boltless system or *Equivalent*. Ductile iron grates to be hot dip galvanized.
- .2 Catch Basin: FTC-223 with hot dip galvanized grate or *Equivalent*.
- .3 End caps to be polymer concrete with coated black steel rail.
- .4 Sealant and installation devices to be used.

## PART 3- EXECUTION

### 3.1 EXAMINATION

- .1 Verify actual measurements/openings by field measurements before fabrication.
- .2 Show recorded measurements on *Shop Drawings*.

### 3.2 INSTALLATION

- .1 Installation shall be in accordance with the manufacturer's instructions.

### 3.3 CLEANING

- .1 Upon completion of the work of this Section, thoroughly clean all trench drain systems in accordance with the manufacturer's recommendations.
- .2 Remove all rubbish and debris caused by the work of this Section.

- .3 Any cutting or damage done to the work of other Sections by the work of this Section, shall be made good to the satisfaction of the affected section and will not be considered or approved as a change in the *Work*.

### **3.4 PROTECTION**

- .1 Protect the installed trench drain system and finish surfaces from damage during subsequent construction activities.

**END OF SECTION**