SPECIFICATIONS

CITY OF TORONTO

Mount Dennis Childcare Centre

1234 Weston Road
Toronto, Ontario

Volume 1

Divisions 0-14

ISSUED FOR TENDER

January 17th, 2020

Coolearth Architecture Inc.
& CS&P Architects Inc.
Project No. 17026

CITY OF TORONTO
MOUNT DENNIS CHILDCARE CENTRE
TORONTO, ONTARIO

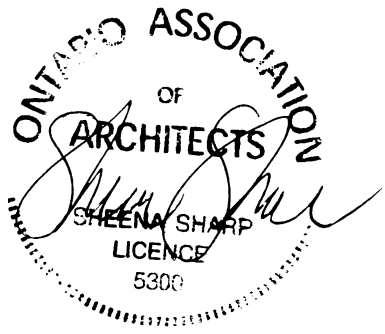
The following Consultants' Seals refer to specific Sections of the Specification designated by symbols and listed in Table of Contents.

COOLEARTH ARCHITECTURE INC.
386 PACIFIC AVE.
TORONTO, ONTARIO M6P 2R1

AND

CS&P ARCHITECTS INC.
2345 YONGE STREET, SUITE 200
TORONTO, ONTARIO M4P 2E5

Architect
"A"



STEPHENSON ENGINEERING
2550 VICTORIA PARK AVE., SUITE 602
TORONTO, ONTARIO M2J 5A9

Structural Consultant
"S"

R MANCINI AND ASSOCIATES
30 MARTHA ST., SUITE 203
BOLTON, ONTARIO L7E 5V1

Mechanical Consultant
"M"

R MANCINI AND ASSOCIATES
30 MARTHA ST., SUITE 203
BOLTON, ONTARIO L7E 5V1

Electrical Consultant
"E"

PMA LANDSCAPE ARCHITECTS LTD.
359 KEELE STREET
TORONTO, ONTARIO M6P 2K6

Landscape Consultant
"L"

MASONGSONG ASSOCIATES ENGINEERING LTD.
7800 KENNEDY ROAD, SUITE 201
MARKHAM, ONTARIO L3R 2C7

Civil Consultant
"C"

TERRAPROBE
11 INDELL LANE
BRAMPTON, ONTARIO L6T 3Y3

Shoring Consultant
"SH"

END OF SECTION

Design Discipline

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

- Owner (O)
- Architect (A)
- Civil Consultant (C)
- Commissioning Consultant (COMM)
- Electrical Consultant (E)
- Landscape Consultant (L)
- Mechanical Consultant (M)
- Structural Consultant (S)
- Shoring Consultant (SH)

VOLUME 1
Divisions 0-14

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 22 - PLUMBING

DIVISION 23 - HEATING, VENTILATING AND AIR CONDITIONING

DIVISION 24 - GEOTHERMAL POWER GENERATION

DIVISION 26 - ELECTRICAL

VOLUME 3
Reports

END OF DOCUMENT

1 GENERAL

1.1 The requirements of the Articles of Agreement, Conditions of the Contract, Division 1 apply to and form all Sections of the Contract Documents and the Work.

1.2 Work in this Specification is divided into descriptive sections which are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and their Subcontractors. The Contractor is responsible for organizing division of labour and supply of materials essential to complete the Contract. The Consultant assumes no liability to act as an arbiter to establish subcontract limits between Sections or Divisions of Work.

1.3 It is intended that Work supplied under these Contract Documents shall be complete and fully operational in every detail for the purpose required. Provide all items, articles, materials, services and incidentals, whether or not expressly specified or shown on Drawings, to make finished Work complete and fully operational, consistent with the intent of the Contract Documents.

1.4 Work designated as “N.I.C.” is not included in this Contract.

1.5 Specifications, Schedules and Drawings are complementary and items mentioned or indicated on one may not be mentioned or indicated on the others.

1.6 Contractors finding discrepancies or ambiguities in, or omissions from the Drawings, Specifications or other Contract Documents, or having doubt as to the meaning and intent of any part thereof shall contact the Consultant for clarification.

1.7 Mention in the specifications or indication on the drawings of materials, Products, operations, or methods, requires that the Contractor provide each item mentioned or indicated of the quality or subject to the qualifications noted; perform according to the conditions stated in each operation prescribed; and provide labour, materials, Products, equipment and services to complete the Work.

1.8 Where the singular or masculine is used in the Contract Documents, it shall be read and construed as if the plural, feminine or neuter had been used when the context or the statement so requires and as required to complete the Work, and the rest of the sentence, clause, paragraph, or Article shall be construed as if all changes in grammar, gender or terminology thereby rendered necessary had been made.

1.9 The terms “approved”, “review”, “reviewed”, “accepted”, “acceptance”, “acceptable”, “satisfactory”, “selected”, “directed”, “instructed”, “required”, “submit”, “permitted”, “approved alternative”, “approved equal”, or similar words or phases are used in standards or elsewhere in Contract Documents, it shall be understood, that words “by (to) the Consultant” follow, unless context provides otherwise.

1.10 The term ‘or approved alternative’ following a list of Products, systems, or manufacturers used in the Contract Documents shall be construed to mean approved by Consultant. Specified products to be Base Bid. Contractor to follow ‘Substitution’ procedures specified in Section 01 60 00 for submitting proposed Products, systems, and manufacturers and obtain Consultant’s approval of the same prior to proceeding with ordering proposed Products and systems or engaging manufacturers. Contractors who purchase Products and systems or engage manufacturers prior to Consultant’s review and acceptance do so at their own risk.

1.11 Where the words 'submit', 'acceptable' and 'satisfactory' are used in the Contract Documents, they shall be considered to be followed by the words 'to the Consultant' unless the context provides otherwise.

1.12 The terms “exposed” or “exposed to view” refers to surfaces that are within the line of vision of persons from any accessible viewpoint, both within and without the building. Where any part of a surface is exposed to view, all other portions of that surface shall also be considered as exposed to view.

2 ADDITIONAL INFORMATION

2.1 Mechanical and Electrical Addendum verbiage and amended Mechanical Drawings relevant to the tender have been appended to this Document and include the following:

.1 Mechanical Scope of Work Addendum.

.2 Amended Mechanical Sketches.

.3 Electrical Addendum.

2.2 Refer to Contract Drawings for full size amended Electrical Drawings which are also relevant to the Work.

2.3 Said documentation is to form part of this Contract.

2.4 It is the Contractor’s responsibility to carefully examine said documentation to fully understand the Work.

3 EXISTING SITE CONDITIONS

3.1 Make a careful examination of the site, and investigate and be satisfied as to all matters relating to the nature of the Work to be undertaken, as to the means of access and egress thereto and therefrom, as to the obstacles to be met with, as to the extent of the Work to be performed, any limitations under which the work has to be executed, and any and all matters which are referred to in the Contract Documents. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to Tender closing.

3.2 Report any inconsistencies, ambiguities, discrepancies, omissions, and errors between Site conditions and Contract Documents to the Consultant prior to the commencement of Work. If inconsistencies, ambiguities, discrepancies, omissions, and errors are not reported and clarified, the most stringent requirement shall govern, as determined by the Consultant. Ensure that each Subcontractor performing work related to the site conditions has examined it so that all are fully informed on all particulars which affect the Work thereon in order that construction proceeds competently and expeditiously.

3.3 Before commencing the Work of any Section or trade, carefully examine the Work of other Sections and trades upon which it may depend, examine substrate surfaces, and report in writing to the Consultant, defects which might affect new Work. Commencement of Work shall constitute acceptance of conditions and Work of other sections, trades, and Other Contractors upon which the new Work depends. If repair of surfaces is required after commencement of specific work it shall be included in the work of the trade providing the specific system or finish.

4 USE OF SITE

4.1 Accept full responsibility for assigned work and storage areas from the time of Contract award until Substantial Performance of the Work.

4.2 Check means of access and egress, rights and interests which may be interfered with. Do not block lanes, roadways, entrances of exits. Direct construction traffic and locate access to site as directed by municipality.

4.3 Where encroachment beyond property limits is necessary make arrangements with respective property owners.

5 ACCESS/PROPERTY CONSTRAINTS

5.1 Provide and maintain access facilities as may be required for access to the Work.

5.2 Determine and make arrangement as required for loading and unloading of equipment and Products at times that will not affect public traffic flow and that will be permitted by the City of Toronto. Conform to City by-laws with regard to parking restrictions and other conditions.

5.3 Make provisions and arrangements and provide allowances if times for loading and unloading allowed by the City of Toronto are other than regular working hours.

5.4 All Products, materials and equipment required on Site shall be portable and/or size suitable for access and movement on Site and without causing damage to buildings.

5.5 The Work shall be confined to the area defined on the drawings and by the property lines except that services connections and certain portions of landscaping, hard paving and curb work shall be executed on Municipal property under regulation of authorities.

5.6 Provide locked doors in barriers, permit access by Owner and Consultant to Work areas and to areas Contractor is responsible for.

5.7 Provide additional engineered shoring where open cut excavation is not attainable.

6 **SECURITY**

6.1 Be responsible for security of all areas affected by Work of this Contract until taken over by Owner. Take steps to prevent entry to the Work by unauthorized persons and guard against theft, fire and damage by any cause.

6.2 Provide suitable surveillance equipment and /or employ guard services, as required to adequately protect the work.

6.3 Take acceptable precautions to guard Work site, premises, materials and the public during and after working hours due to the Work of this Contract.

6.4 A regular full time watchman is generally not required on Site, however, if in the opinion of the Consultant the Work is not adequately protected, the Owner may request that a watchman be employed by the Contractor at no extra cost to the Contract.

7 **WEATHER**

7.1 Incorporate into the Contract Schedule allowances for the number of working days lost due to inclement weather, which can be anticipated, on the basis of analysis of information available from Environment Canada, for weather conditions on and near the Site, over the last ten (10) years. The Contractor may be entitled to a schedule extension for those activities on the critical path which are delayed on account of inclement weather, assessed on a quarterly basis, by the number of days in excess of the anticipated number of working days for the quarter in question by more than 20%. No additional payment will be made on account of any such schedule extension.

7.2 For the purpose of this clause the quarters are defined as January 1 to March 31, April 1 to June 30, July 1 to September 30, and October 1 to December 31.

END OF SECTION

Additional Information

MECHANICAL SCOPE OF WORK ADDENDUM

To:	Susan Spencer Lewin, Principal		
Company:	CS&P Architects Inc	**Project No:**	3043-19
Project:	Mount Dennis Childcare Centre	**Date:**	January 17, 2020

Drawings Issued: MSK-001 through MSK-005

For reference, a markup has been prepared by Reinbold Engineering of the 2019-05-07 Issued for Tender Mechanical drawing set prepared by R. Mancini, noting parts of the tender document impacted by this addendum and noting where to find updated design information issued as part of this addendum.

1. Changes to Design in Mechanical Drawings M1-M18

1.1. DRAWING M-1: MECHANICAL SITE PLAN

1.1.1. RELOCATE the hose bib currently located on the west side of Recycling/Refuse Storage Shed to the north side, at the west end of the shed.

1.2. DRAWING M-2: UNDERGROUND PIPING PLUMING AND DRAINAGE FLOOR PLAN

1.2.1. Revise piping to avoid cleanout being located under water-source heat pumps in Room B04. See Sketch MSK-001 in this addendum.

1.3. DRAWING M-3: PLUMBING AND DRAINAGE BASEMENT FLOOR PLAN

1.3.1. Revise RWL at grids C9 to 100mmØ, from 75mmØ.
1.3.2. Revise CW line at gridlines F8 serving two hose bibs above to 25Ø
1.3.3. Revise Plumbing Fixture Schedule as shown in Sketch MSK-002 in this addendum.

1.4. DRAWING M-4: PLUMBING AND DRAINAGE FIRST FLOOR PLAN

1.4.1. Revise one fixture from WC-2 to WC-1 type in WC & CHANGE room 109A.
1.4.2. Revise two fixtures from WC-2 to WC-1 type in WC & CHANGE room 112A.
1.4.3. Revise 75mmØ RWL at grids Ax9 to a 2% slope for the horizontal portion above the vestibule.
1.4.4. Revise RWL at grids C9 to 100mmØ, from 75mmØ.

1.5. DRAWING M-5: PLUMBING AND DRAINAGE SECOND FLOOR PLAN

1.5.1. Revise one fixture from WC-2 to WC-1 type in WC room 205A.
1.5.2. Revise one fixture from WC-2 to WC-1 type in WC room 206A.
1.5.3. Note that the architectural ceiling design in Corridor 212 requires that all plumbing venting for areas south of gridline C be routed within dropped ceiling adjacent to gridline 2, and fully coordinated with ductwork.
1.5.4. Revise size of SAN pipe serving sinks in Rm 205/206 to from 40Ø to 50Ø.
1.5.5. Revise RWL running from grid C8 to grid C9 to 100mmØ, from 75mmØ.

1.6. DRAWING M-6: H.V.A.C. BASEMENT FLOOR PLAN

1.6.1. Revise all condensate drainage lines shown at 20mmØ to 25mmØ.
1.6.2. Revise all HWS&HWR lines shown at 20mmØ to 25mmØ.

1.7. DRAWING M-7: H.V.A.C. FIRST FLOOR PLAN

1.7.1. Revise all condensate drainage lines shown at 20mmØ to 25mmØ.

1.7.2. Revise all HWS&HWR lines shown at 20mmØ to 25mmØ.
1.7.3. Revise main branch supply ductwork serving HP-7 to 250x275 from 200x250.
1.7.4. Revise main branch supply ductwork serving HP-6 to 250x275 from 200x250.
1.7.5. Revise south branch supply ductwork serving HP-4 to 250x275 from 200x250, and revise north branch from 300x150 to 325x200, transitioning to 250x275 south of gridline D.
1.7.6. Provide two new fully concealed ambient air curtains, equal to Biddle model D-DF M-150-A-C Maximum current consumption to be 2.28A at 230V/1Ph, complete with wall mounted controller with on, off, and fan speed selections, and complete with door sensor.

1.8. DRAWING M-14: MECHANICAL ROOM MAIN PIPING SCHEMATIC AND SECTIONS

1.8.1. Provide energy metering measured by installing two temperature sensors and one flow meter:
- BTU-1 – thermal energy pumped by P3/P4 to the geothermal field.
- BTU-2 – thermal energy pumped by P1/P2 to the heat pump loop
- BTU-3 – thermal energy pumped by P9, from the solar thermal collection system.
- BTU-4 – thermal energy pumped by P5 to the water-to-water heat pumps system.
- BTU-5 – thermal energy for domestic potable water heating.

1.8.2. Provide energy metering measured by installing two temperature sensors and using a software-based calculation of flow rate derived from pump curve data and speed drive operating point for VBTU-6, measuring the thermal energy delivered to HC-1.
1.8.3. Reference markup comments for clarification of pipe connection intent.
1.8.4. Reference Sketch MSK-003 for revised Mechanical Room section (HRU-1 ductwork.)

1.9. DRAWING M-16: MECHANICAL SCHEMATICS AND DETAILS

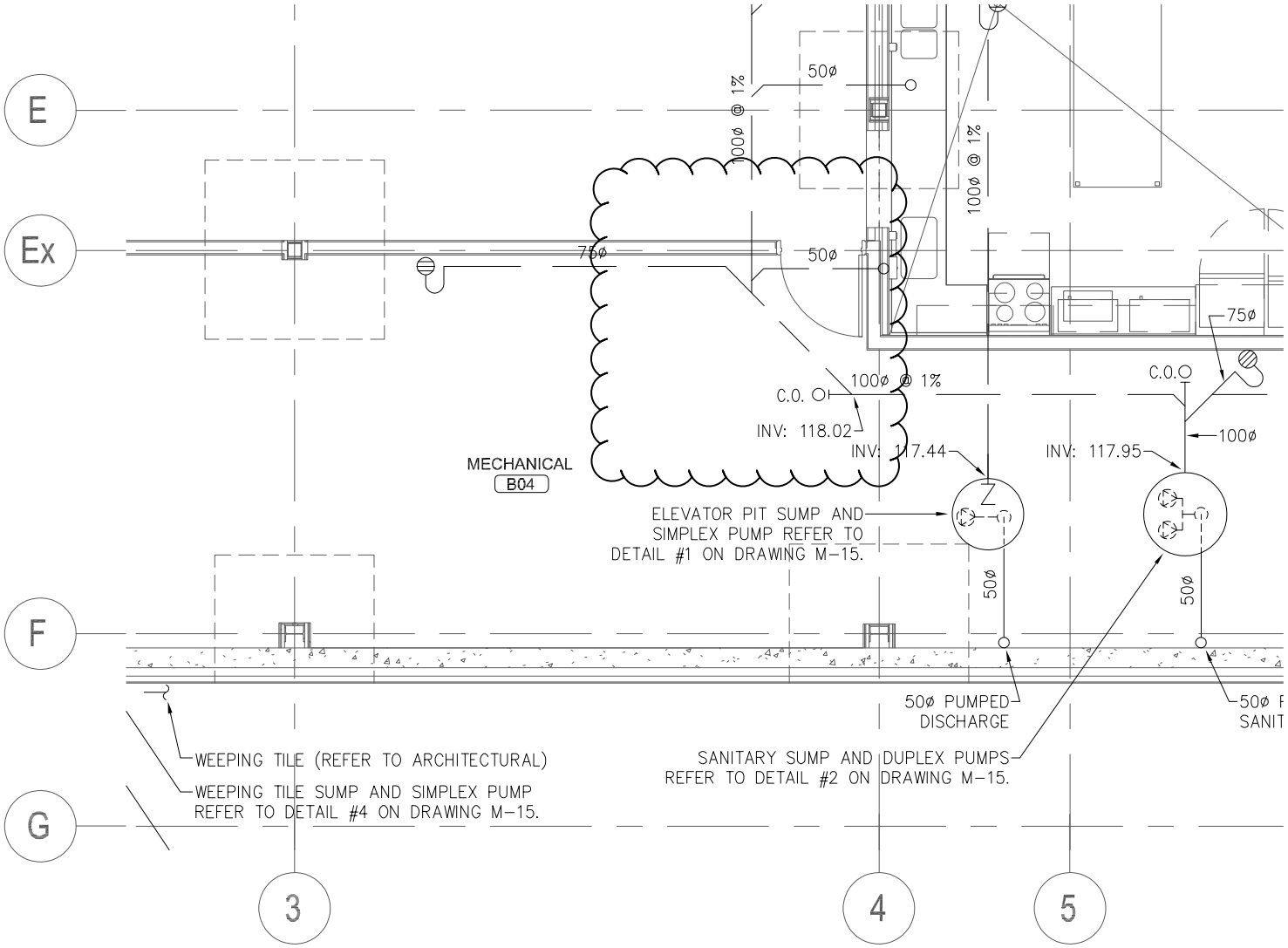
1.9.1. See Sketch MSK-004 for revised fresh air connection detail in heat pump closet.

1.10. DRAWING M-18: MECHANICAL SCHEDULES

1.10.1. Revise all equipment specified at 600V/3PH to 208V/3PH:
- HRU-1: Power: Power: 208V/3PH/60Hz, MCA: 31A, Max Breaker Size: 50A
- DWH-1: -Power: 208V/3PH/60Hz, MCA: 37.5A
- WHP – 1,2,3,4,5: Power: 208V/3PH/60Hz, MCA: 17A, Max Breaker Size: 30A

1.10.2. See Sketch MSK-005 for revised force flow heater schedule.
1.10.3. REVISE remarks applying to Pumps P-1, P-2, P-3, and P-4 as follows:
"CAPABLE OF PARRALEL OPERATION, WITH BACK-UP DUTY/STAND BY MODE EACH PUMP C/W INTEGRATED VFD, PUMP STOP/START AND SPEED CONTROLLED BY BAS VIA PARRALEL PUMP CONTROLLER."

END OF ADDENDUM



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DATE: 9/17/2019 12:23:21 AM

PROJECT #: 3043-19

SCALE:

CHECKED BY: CS

DRAWN BY: CS

DRAWING: M-2 PART FOUNDATION PLUMBING PLAN

PROJECT NAME: MOUNT DENNIS CHILDCARE CENTRE

DWG #: MSK -001

PLUMBING FIXTURE SCHEDULE

SYMBOL	DESCRIPTION	CW (mm)	HW (mm)	TEMP.W. (mm)	WASTE (mm)	VENT (mm)
WC-1, 2 & 3	WATER CLOSET F.T.	15	-	-	100	40
L-1, & 2	LAVATORY	12	12	12	40	32
S, S-1 & S-6	SINGLE BOWL SINK	12	12	12	40	32
S-2	DOUBLE BOWL SINIK	12	12	12	40	32
S-3	SINGLE BOWL LAUNDRY SINK	12	12	-	40	32
S-4	TRIPLE BOWL SINK	12	12	12	50	40
S-5	ABOVE COUNTER BASIN	12	12	12	40	32
S-7 / EW-2	HAND WASH SINK WITH EYE WASH	12	12	12	40	32
S-8	TRIPLE BOWL KITCHEN SINK	15	15	15	50	40
SH-1	SHOWER	15	15	15	75	40
JS-1	JANITOR / MOP SINK	15	15	-	75	40
FD	FLOOR DRAIN	10	-	-	75 OR 100	40
CW	CLOTHES WASHER	15	15	-	50	40
DW	DISHWASHER	-	12	-	-	-
EW-1	EYE & FACE WASH	12	12	12	40	32

NOTES:

1. REFER TO ARCHITECTURAL DWGS. FOR MTG. HEIGHTS OF PLUMBING FIXTURES.
2. TYPE 'S' SINK BASIN & FAUCET SUPPLIED BY GENERAL CONTRACTOR. BASIN INSTALLED BY GENERAL CONTRACTOR.
3. TYPE 'S-8' KITCHEN SINK BASIN SUPPLIED & INSTALLED BY GENERAL CONTRACTOR.
4. THERMOSTATIC MIXING VALVE (TWV) FOR EW-1, EW-2, & EW-3 TO BE INSTALLED MINIMUM 1.2 METER TO MAXIMUM 3.0 METER FROM FIXTURE. REFER TO TMV MANUFACTURERS INSTALLATION INSTRUCTIONS.

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DATE: 9/16/2019 11:55:41 PM

PROJECT #: 3043-19

SCALE:

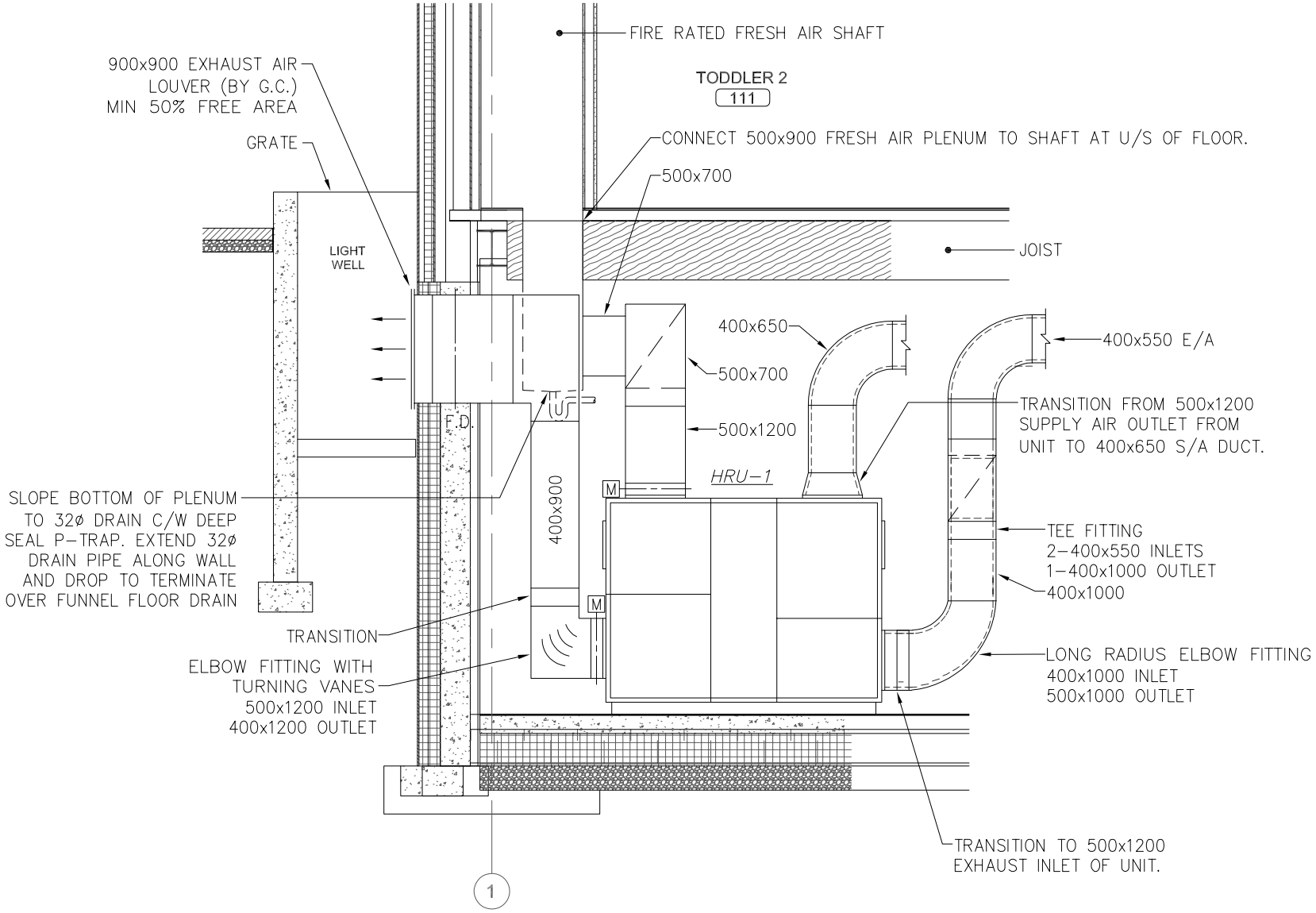
CHECKED BY: CS

DRAWN BY: CS

DRAWING: M-3 PLUMBING FIXTURE SCHEDULE

PROJECT NAME: MOUNT DENNIS CHILDCARE CENTRE

DWG #: MSK -002



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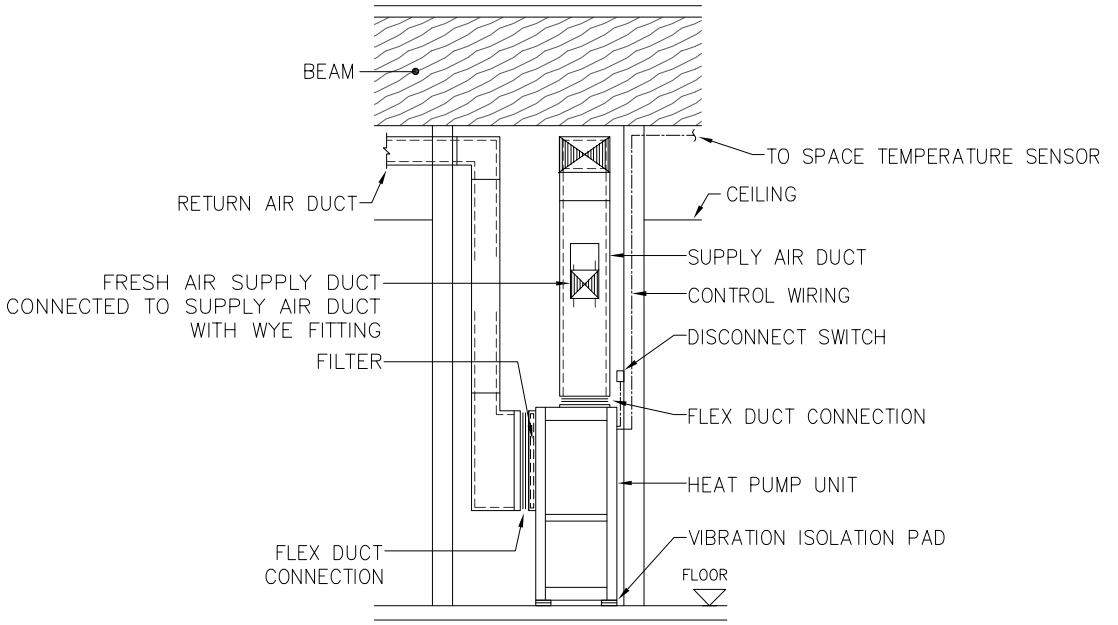
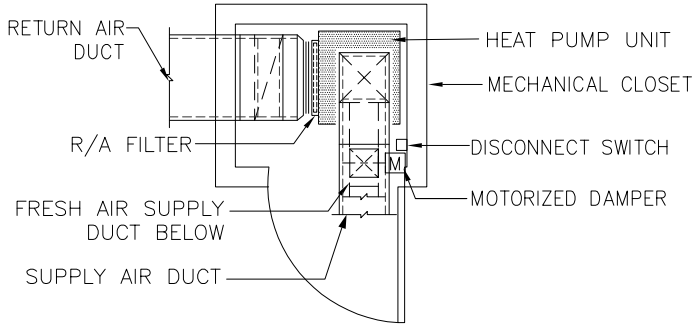
DATE: 9/17/2019		DRAWING: M-14 MECHANICAL ROOM SECTION	DWG #: MSK -003
PROJECT #: 3043-19	SCALE: 1:50	PROJECT NAME: MOUNT DENNIS CHILDCARE CENTRE	
CHECKED BY: CS	DRAWN BY: CS		



ELEVATION (FLOOR MOUNT)



NOTE:
PIPING NOT SHOWN

PLAN VIEW

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DATE: 9/17/2019

PROJECT #: 3043-19

SCALE:

CHECKED BY: CS

DRAWN BY: CS

DRAWING: M-16 HEAT PUMP CLOSET INSTALLATION DETAIL

PROJECT NAME: MOUNT DENNIS CHILDCARE CENTRE

DWG #: MSK -004

FORCE FLOW HEATER SCHEDULE

DESIGNATION	TYPE	MODEL NO.	HEATING CAPACITY	FLOW RATE (GPM)	EWT (F)	LWT (F)	COIL PRESSURE DROP (FT)	AIR FLOW RATE (CFM)	EAT (F)	FAN SPEED	ELECTRICAL CONSUMPTION (W/CFM)	POWER SUPPLY (VOLTS/WATTS)	UNIT SIZE (HEIGHT x LENGTH x DEPTH)	WEIGHT (LBS)	SEMI-RECESSED FRONT PANEL (HEIGHT x LENGTH x DEPTH)
FF-1A, FF-1B	BRIZA BUILD-IN-WALL	BZB1.052072002-PIPE	8,048	1.6	120	105	4.7	215	68	10V	0.07	24VDC / 15.6W	20.5" x 28.3" x 4.6"	35	28.3" x 37.4" x 0.6"
FF-2A. FF-2B	BRIZA BUILT-IN-CEILING	BZBC.0520720 0 2-PIPE	8,048	1.6	120	105	4.7	215	68	10V	0.07	24VDC / 15.6W	20.5" x 28.3" x 4.6"	35	28.3" x 37.4" x 0.6"
FF-3, FF-4, FF-5	BRIZA BUILT-IN-CEILING	BRIZA22.08/2P 2-PIPE	34,500	3.9	120	102	10.1	744	68	10V	0.12	110V / 86W	20.5" x 40. 2" x 4.6"	61	28.3" x 49.2" x 0.6"

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DATE: 9/17/2019

PROJECT #: 3043-19

SCALE:

CHECKED BY: CS

DRAWN BY: CS

DRAWING: M-18 FORCE FLOW HEATER SCHEDULE

PROJECT NAME: MOUNT DENNIS CHILDCARE CENTRE

DWG #: MSK -005

CS&P Architects Inc.
2345 Yonge Street, Suite 200
Toronto, ON
M4P 2E5

Attention: **Susan Spencer Lewin**

Email: slewin@csparch.com
File No.: T255 Date: January 17, 2020

Reference Drawing: E-2 – SITE PLAN ELECTRICAL

Add: Three (3) conduit rough ins for future EVSE
One (1) EVSE equipment, similar to Charge Point CPF25

Reference Drawing: E-11 – DETAILS, RISER DIAGRAM AND SINGLE LINE

Revise: Single line diagram as per the attached ESK-001. This replaces the distribution diagram currently shown on E-11.

Revise: Panel 'DP2B' to be 400A.

Add: One (1) Power quality Monitor. Schneider Electric Ion 7560 or equivalent.

Add: Electrical sub metering points as shown

~ End of Electrical Addendum ~

Reason: City request.

1 GENERAL

1.1 Allowances included herein are for items of Work which could not be fully quantified prior to Bidding.

1.2 Expend each allowance as directed by the Consultant in writing. Work covered by allowances shall be performed for such amounts and by such persons as directed by Consultant.

1.3 Each allowance will be adjusted to actual cost as defined hereunder and amended accordingly by written order.

1.4 Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in Conditions of the Contract.

1.5 A schedule shall be prepared jointly by the Consultant and Contractor to show when items called for under allowances must be authorized by the Consultant for ordering purposes so that the progress of the Work will not be delayed.

1.6 Where a Cash Allowance is for work performed under a Subcontract, the Contractor shall Bid the work involved and submit the Bids received, with the Contractor's recommendations, for approval.

2 CASH ALLOWANCE(S)

2.1 Cash allowances, unless otherwise specified, cover the net cost to the Contractor of services, Products, construction machinery and equipment, freight, handling, unloading, storage, installation where indicated, and other authorized expenses incurred in performing the Work.

2.2 Cash allowance amounts shall not be included by the Contractor or Subcontractors in the amount for their Work.

2.3 Supply only allowances shall include:

- .1 Net cost of Products.
- .2 Delivery to Site.
- .3 Applicable taxes and duties, excluding HST.

2.4 Supply and install allowances shall include:

- .1 Net cost of Products.
- .2 Delivery to Site.
- .3 Unloading, storing, handling or hoisting of Products on Site.
- .4 Protection from damage by elements or otherwise.
- .5 Installation, finishing and commissioning of Products.
- .6 Other expenses required to complete installation.
- .7 Applicable taxes and duties, excluding HST.

2.5 Inspection and testing allowances shall include:

- .1 Net cost of inspection and testing services.

.2 Transportation costs to and from the site.
.3 Equipment required to perform tests or inspections.
.4 Costs of shipping samples to laboratory for testing.
.5 Applicable taxes and duties, excluding HST.
.6 Include cash allowances in the Bid Price for material inspection and testing of the following:
  .1 Earthwork (such as soil and fill compaction and subgrade work).
  .2 Cast-in-place concrete and reinforcement for footings, foundations, slabs, curbs, and walks.
  .3 Asphalt paving.
  .4 Structural steel.
  .5 Wood deck.
  .6 Wood timber connections.
  .7 Air barrier and vapour control layer.
  .8 Cementitious fireproofing.
  .9 Windows, curtain walls, entrances and glazing.
  .10 Waterproofing and dampproofing.
  .11 Roofing.
  .12 Blower door testing of building envelope.

2.6 Other costs related to work covered by cash allowances are not covered by the allowance but shall be included in the Contract Price.

2.7 The Owner reserves the right to re-assign values from one cash allowance to another. When the total of all cash allowances has been expended, the Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in the Contract Documents.

2.8 Progress payments on accounts of work authorized under cash allowances shall be included in the monthly certificate for payment.

2.9 Submit, before application for final payment, copies of all invoices and statements from suppliers and Subcontractors for work which has been paid from cash allowances.

2.10 Include in the Bid Price the amount of each cash allowance:

.1	Interior signage:	$16, 500
.2	Exterior signage within site:	$11, 000
.3	City of Toronto Streetscape traffic signage (outside of property):	$11, 000
.4	Toronto Water - water connections:	$84, 150
.5	Hydro connections:	$82, 500
.6	Bell/Rogers connection:	$5, 500
.7	Testing and inspections:	$55, 000

.8	Geothermal testing (CSA 440 Verification):	$11, 000
.9	Decorative fence:	$22, 000
.10	Telephone and data wiring:	$5, 500
.11	IT equipment:	$55, 000
.12	Blinds: - Allowance shall cover both interior and exterior blinds. - All interior playrooms, staff room, office and kitchen are to be complete with black-out blinds and blackout side and bottom channels to prevent visibility into windows and doors during lockdowns.	$16, 500
.13	Testing and balancing:	$33, 000
.14	Finish hardware (supply only):	$69, 300
.15	Automatic door operators (supply only):	$33, 000
.16	Solar panels and system:	$600, 000
.17	Security system:	$77, 000
.18	Batteries- 8 Tesla Powerwalls:	$165, 000

Total lump sum of cash allowances: **$1,352, 950**

END OF SECTION

1 MODIFICATIONS TO CONTRACT

1.1 Supplemental Instruction: as issued by the Consultant, consistent with the intent of the Contract Documents, and will not involve an adjustment in Contract Price or Contract Time.

1.2 Proposed Change: as issued by the Consultant, will notify the Contractor of an impending or proposed change to the Work, and will require submission of a quotation from the Contractor and all affected Subcontractors for each item noted. Submit quotation within the time period stipulated on the form, and indicate separate line items for labour and materials in each case. Work outlined in a Proposed Change must not proceed without the issuance of a Change Order signed by the Owner.

1.3 Change Directive: will be issued by the Consultant where an immediate response is required to an on-site condition. This form will authorize the Contractor to proceed with the change, with the stipulation that accurate accounts of costs be recorded, and may contain an upset cost, as agreed upon by the Owner and the Contractor.

1.4 Change Order: will be issued by the Consultant upon review and approval of quotations for a Proposed Change, or a Change Directive, and authorizes the Contractor to proceed with the change(s) proposed. A Change Order will amend the Contract Price, and/or the Contract Time.

END OF SECTION

1 APPLICATIONS FOR PAYMENT

1.1 Applications for payment on account may be made monthly as the Work progresses, and shall be preceded by the submission of a Schedule of Values for review by the Consultant, in accordance with the Contract.

1.2 The second and all subsequent applications for payment shall include a statement based on the Schedule of Values, a statutory declaration (CCDC 9B), and a standard Workers Compensation Certificate of Clearance.

1.3 An up-to-date Detailed Construction Schedule, Contractor log-in sheets and progress photographs shall be submitted concurrently with monthly progress payment application.

2 SCHEDULE OF VALUES

2.1 Submit Schedule of Values in spreadsheet form acceptable to the Consultant.

2.2 Identify on each Schedule of Values, the following information:
- .1 Date of Issue.
- .2 Project name.
- .3 Owner's name.
- .4 Contractor's name.
- .5 Payment period.
- .6 Payment certificate number.

2.3 Specification sections shall serve as guideline for an acceptable breakdown.

2.4 Items of work listed shall include, but not be limited to, separate line items for the following:
- .1 General Accounts.
- .2 Mobilization.
- .3 Supervision.
- .4 Bonds and Insurance.
- .5 Permits and Licenses.
- .6 Operations and Maintenance Manuals/As-Built Drawings.
- .7 All trades or portions of the Work, generally in chronological order.
- .8 Provision of other Products and/or services.
- .9 Cash Allowance expenditures.
- .10 Changes in the Work.

2.5 The total Contract amount for each trade or portion of the Work shall be listed beside each item.

2.6 For the purposes of monthly payments, the following values shall be assigned for Maintenance Manuals and As-Built Drawings.
- .1 Architectural Maintenance Manuals: $2000.
- .2 Architectural As-Built Drawings: $3000.
- .3 Structural As-Built Drawings: $3000.
- .4 Mechanical Maintenance Manuals: $2000.
- .5 Mechanical As-Built Drawings: $3000.

.6 Electrical Maintenance Manuals: $2000.
.7 Electrical As-Built Drawings: $3000.

2.7 The Values of the Work shall be listed as to the aggregate percentage and dollar value completed, under the following major headings:
.1 Initial Contract Amounts for each line item.
.2 Progress to Date.
.3 Percent Complete.
.4 Current Invoice.
.5 Previous Billings.
.6 Contract Balance.

2.8 Work shall be subtotalled under original Contract amounts, Cash Allowance expenditures, and Changes to the Work.

2.9 Final totals shall identify:
.1 Total amount.
.2 Holdback deducted.
.3 Holdback released.
.4 Amount invoiced to date.
.5 Net amount.
.6 HST.
.7 Amount due this Certificate.

END OF SECTION

1 GENERAL

1.1 Coordination of the Work of all Sections of the specifications as required to complete the Project is the responsibility of the Contractor.

1.2 Project supervision:

.1 The Contractor shall provide and maintain full-time supervision on site. The supervisor shall be responsible for the overall day-to-day coordination on site between subtrades.

.2 The supervisor shall coordinate the work of all subcontractors, and provide such assistance as is necessary, including but not limited to;

.1 Layout,

.2 Rough carpentry work for blocking, strapping, nailers, etc.

1.3 Cooperate and coordinate with Other Contractors including Other Contractor's employed by Owner.

1.4 Ensure that Subcontractors and trades cooperate with other subcontractors and trades whose work attaches to or is affected by their own work. Ensure that minor adjustments are made to make adjustable work fit fixed work.

1.5 Allow access of Owner's Other Contractors on site and to areas of Work. Cooperate and coordinate with such Other Contractors. Schedule work to complement work of such Other Contractors.

1.6 Entry by the Owner's own forces and by Other Contractors shall not mean acceptance of the Work and shall not relieve the Contractor of their responsibility to complete the Contract.

1.7 Placing, installation, application and connection of work by the Owner’s own forces or by Other Contractors on and to the Contractor's Work shall not relieve the Contractor of his responsibility to provide and maintain the specified warranties.

1.8 Coordinate with removals/installations specified in other Divisions and Other Contracts.

1.9 Coordination of the installation of systems specified in Divisions 21, 22, 23, 24, 26 and 28, including the interrelating operation and functioning between components of a system and between systems, including with structural elements, is the responsibility of those performing the work of those Divisions, with final coordination the responsibility of the Contractor.

1.10 Pay particular attention to types of ceiling construction and clearances throughout, especially where recessed fixtures are required. Coordinate work with Other Contractors and Subcontractors wherever ventilation ducts or piping installations occur to ensure that conflicts are avoided.

1.11 Install ceiling mounted components in accordance with final ceiling plans. Inform Consultant of conflicting installations.

1.12 Ceiling coordination:

.1 Install and arrange ducts, piping, tubing, conduit, equipment, fixtures, materials and product to conserve headroom and space with minimum interference and in neat, orderly and tidy arrangement. Run pipes, ducts, tubing and conduit, vertical, horizontal and square with building grid unless otherwise indicated. Install piping, ducts, and conduit as close to underside of structure as possible unless shown otherwise.

.2 Provide coordination drawings for all conduit devices at exposed wood ceiling which must be approved by the Consultant. Sleeving of wood beams will not be permitted.

.2 Make provision, without interference or restriction by items located within the ceiling space for unrestricted relocation of light fixtures.

1.13 Where supports or openings are to be left for the installation of various parts of the Work furnish the necessary information to those concerned in ample time so that proper provision can be made for such items. Have cutting, drilling and other remedial work, and the subsequent patching or other work required for failing to comply with this requirement, performed at a later date at no additional Cost to Owner.

1.14 Properly coordinate the work of the various Sections and trades, taking into account the installations to assure the best arrangement of pipes, conduits, ducts and mechanical, electrical and other equipment, in the available space. Under no circumstances will any extra payment be allowed due to the failure by the Contractor to coordinate the work. If required, in critical locations, prepare interference and/or installation drawings showing the work of the various Sections as well as the installation, and submit these drawings to the Consultant for review before the commencement of work. Proceed with work in these areas only as, and when directed by the Consultant.

1.15 Coordinate with mechanical and electrical trades to ensure protecting supporting, disconnecting, cutting off, capping, diverting, relocating or removing of services in areas of Work before commencement of alteration work.

1.16 In case of damage to active services on utilities, notify Consultant and respective authorities immediately and make all required repairs under direction of Consultant and respective authorities. Carry out repairs to such damaged services and utilities continuously to completion, including working beyond regular working hours. Costs to be borne by the Contractor.

2 METRIC DIMENSIONS

2.1 Measurements in this specification are expressed in metric (SI) units and depending on the progress made in the various sectors of the industry are either hard or soft converted units.

2.2 All metric units specified shall be taken to be the minimum acceptable unless otherwise noted.

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

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

3 BUILDING DIMENSIONS

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

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

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

3.4 Do not scale directly from the Drawings. If there is ambiguity or lack of information, immediately inform the Consultant. Changes required through the disregarding of this clause shall be the responsibility of the Contractor.

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

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

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

4 INTERFERENCE AND COORDINATION DRAWINGS AND DOCUMENTS

4.1 Submit interference and coordination drawings and documents in accordance with Section 01 31 23.

4.2 The Contractor shall facilitate production of interference drawings where necessary for coordination of the Work. Provide such interference drawings to the Consultant for review.

END OF DOCUMENT

1 PRE-CONSTRUCTION MEETING

1.1 Arrange and conduct pre-construction meeting(s).

1.2 Co-ordinate and organize attendance by representatives of major Subcontractors and parties in contract with the Contractor.

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

1.4 Prepare and distribute copies of Agenda prior to meeting.

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

.1 Review project communications procedures.

.2 Review contract administration requirements including submittals, payment, and change order procedures.

.3 Identify all critical points on construction schedule for positive action.

.4 Identify any product availability problems and substitution requests.

.5 Establish site arrangements and temporary facilities.

.6 Review Consultants inspection requirements.

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

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

1.7 Record minutes of meeting and distribute type written copies to all participants and other interested parties, within one week of meeting date.

2 PROGRESS MEETINGS

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

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

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

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

2.5 Prepare and distribute copies of Agenda prior to meeting.

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

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

.1 Review and agreement of previous minutes.

.2 Construction safety.

.3 Status of submittals.

.4 Quality control.

.5 Co-ordination.

.6 Contract Schedule

.7 Work plan up to next scheduled meeting.

.8 Requests for information/clarification.

.9 Contemplated changes.

2.8 Record minutes of meeting and distribute type written copies to all participants and other interested parties, within one week of meeting date.

END OF SECTION

1 SECTION INCLUDES

1.1 Provision of all labour, materials, equipment and incidental services necessary to furnish interference and coordination drawings and documents for effective coordination of Mechanical and Electrical Work with each other and with the Work of other Sections.

2 ADMINISTRATIVE REQUIREMENTS

2.1 Coordination:

.1 Coordinate sequencing of Work, placement of Products and arrangement of services of various Subcontractors and other contractors to assure the best arrangement of pipes, conduits, ducts, equipment, supports and other items in the available space.

.2 Under no circumstances will any claim for extra cost be allowed due to the failure by the Contractor to coordinate Work.

.3 Prepare Interference and Coordination Drawings, showing the Work of various Subcontractors and submit drawings to Consultant for approval before commencing Work.

.4 The Contractor and all Subcontractors shall cooperate with and coordinate their Work with each other and with other contractors in proper sequence and as required for the satisfactory and expeditious completion of the Work;

- .1 Take field dimensions relative to this Work.
- .2 Fabricate and erect work to suit field dimensions and field conditions.
- .3 Provide all forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the Work and set in place or instruct the related Subcontractors as to their location.
- .4 Pay the cost of extra Work caused by and make up time lost as the result of failure to furnish the necessary cooperation, information or items to be fixed-to or built-in, in adequate time.

.5 Coordinate placement of equipment to ensure that components will be properly accommodated within spaces shown in the Contract Documents prior to commencement of Work;

- .1 In areas where equipment and services are exposed care shall be taken to organize and layout services in an organized and orderly manner.
- .2 Where possible services are to run parallel or at right angles to one another as required.
- .3 Consultant may request that service layout be reconfigured to suit sightline concerns during the Interference and Coordination Drawings review phase. These drawings changes are to be executed at no additional cost to the Owner.

3 INTERFERENCE AND COORDINATION DRAWINGS

3.1 Submit Interference and Coordination Drawings of installation of Mechanical and Electrical Work for efficient use of available space, for proper sequence of installation, and to resolve conflicts with the Work of all Sections.

3.2 Interference and Coordination Drawings will show the following minimum information to demonstrate understanding and coordination of Work of various Sections with the Work of:

- .1 Structural elements.
- .2 Mechanical (plumbing, fire protection, HVAC, geothermal, building controls).
- .3 Electrical (power distribution and generation, lighting, fire alarm, communications, security & access controls, and facility protection).
- .4 Piping: indicate sizes, locations and arrangements, including valves, indicating instruments, pumps and other accessories. Allow for thickness of insulation, as specified, for various types of piping.
- .5 Ductwork: sizes, locations and arrangement including accessories such as dampers (fire, balancing and operating).
- .6 Conduits and conduit boxes:
  - .1 Provide drawings for decorative conduits at exposed areas for the Consultant's approval. Decorative conduits shall be used at all exposed ceilings, except for service spaces.
  - .2 Show surface-mounted and embedded conduit pipes, elbows, boxes and other accessories for power distribution, power generation, control wiring, fire alarm system, building controls system, exposed wood ceiling and other related systems.
  - .3 All decorative conduits and decorative conduit boxes for use at exposed wood ceiling shall be approved by the Consultant. Sleeving of wood beams will not be permitted.
- .7 Equipment:
  - .1 Hydronic specialties, boilers, water heaters, chillers, coolers, radiant panels, fan coil units, air handling units, fans, VAV terminal units, etc.
  - .2 Transformers, power distribution equipment, wiring devices, panel boards, lighting equipment, fire alarm devices, etc.
- .8 Sleeves: show size and location of penetrations through loadbearing and non-loadbearing elements.
- .9 Inserts: Products or elements of assemblies to be cast into concrete.

3.3 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, wall and ceiling assemblies, acoustical and seismic isolation, Products and systems involving life safety, conveying systems, electrical distribution.

3.4 Interference and Coordination Drawings shall be submitted in a format as agreed upon by the Consultant.

3.5 Areas of conflict or interference shall be resolved in a mutually agreed manner between affected Subcontractors and shall be resubmitted on said Interference and Coordination Drawings until such time as accepted by Consultant.

3.6 Mechanical and Electrical Subcontractors shall submit Interference and Coordination Drawings in uniform scale, with information assembled on separate layers within the electronic files to allow overlays to be assembled which show all components of various trades. Upon incorporation of details, Drawings shall be submitted jointly to Consultant for review.

3.7 Ensure that accesses and clearances required by jurisdictional authorities and/or for easy maintenance of equipment are indicated and accommodated in layout of equipment and services.

3.8 Interference and Coordination Drawings shall be circulated for review and mark-ups by Subcontractors responsible for Work of Divisions 3, 5, 9, 14, 22, 23, 24, 26, and 28.

3.9 Coordinate preparation and submission of Interference and Coordination Drawings with Shop Drawings.

4 SLEEVING AND INSERT DRAWINGS AND TEMPLATES

4.1 Prepare sleeving drawings for work of Divisions 21, 22, 23, 24, 26 and 28, showing size and location of all penetrations through load bearing elements. Submit sleeving drawings in the form of digital PDF format to Consultant for review not less than 15 days prior to construction of affected elements.

4.2 Prepare insert setting drawings for work to be cast into concrete and/or mortared into masonry elements. Submit insert setting drawings in the form of a transparency and 4 prints to Consultant for review not less than 15 days prior to construction of affected elements.

4.3 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, fixtures, equipment, holes, sleeves, inserts, anchors, accessories, fastenings, connections, and access panels are provided by each Section whose work requires cooperative location and installation by other Sections, and that such information is communicated to the applicable installer.

4.4 Provide cutting, fixing and making good to the work of Other Contractors, Subcontractors and trades as required for sleeving and inserts and make up time lost as a result of failure to comply with this requirement, at no additional cost to the Owner.

END OF DOCUMENT

1 GENERAL

1.1 Be responsible for planning and scheduling of the Work. As a minimum, prepare and update the following schedules:

.1 Contract Schedule.

.2 Detailed Construction Schedule.

1.2 Be responsible for ensuring that Subcontractors plan and schedule their respective portions of the Work. Subcontractor's schedules shall form part of the above mentioned schedules.

1.3 Be responsible for submitting Preventative Action Reports and Corrective Action Reports as required for the Project.

2 DEFINITIONS

2.1 “Detailed Construction Schedule” means the schedule for the Work identified as agreed to between Owner and Contractor, which sets out in detail the Work that Contractor anticipates it will perform, including, but not limited to all of the Work Milestones and any anticipated Owner participation required or desired. The Construction Schedule is to be in the form of a series of activities and milestones that are logically linked utilizing Critical Path Methodology and 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.

2.2 “Milestone” means any of the following milestone events or activities and includes the applicable dates for commencing and completing such event or activity:

.1 Substantial Performance by the scheduled Substantial Performance date;

.2 Contract Completion by the scheduled Contract Completion date;

.3 commencement of warranty periods;

.4 the application for and obtainment of all permits, licences, approvals and agreements;

.5 prominent planning and procurement events for equipment;

.6 foundations poured;

.7 airtightness test;

.8 Close-in;

.9 HVAC, plumbing, and electrical rough-ins;

.10 interior partition and finish work;

.11 Ground source up and ready for inspection and testing;

.12 building systems and equipment commissioning for the Work;

.13 deficiency reviews;

.14 building systems training for the Work;

.15 Building Permit closeout and occupancy review;

.16 the turnover of space by Contractor to Owner;

.17 and “Milestones” means, collectively, all of the Work Milestones.

3 ROLES

3.1 Contractor:

.1 The Contractor is responsible for the preparation and maintenance of construction schedule information including the Detailed Construction Schedule, Contract 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 Detailed Construction Schedule, the Contract 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.

4 CONTRACT SCHEDULE

4.1 Prepare and submit the Contract Schedule within 14 days following award of Contract. This schedule, once it is reviewed by the Consultant and if it meets the Consultant's project requirements, will form part of the Contract.

4.2 The Contract Schedule shall be developed using a logic network technique for planning and scheduling.

4.3 Schedule proposed by Contractor shall be based on the following assumptions:

.1 Critical path base line is considered by Contractor as reasonable and achievable.

.2 Schedule is based on resources which have been committed for this Project by Contractor and will be readily available when needed.

.3 Schedule is based on normal average weather conditions, as documented by official weather records.

.4 Float belongs to Project.

4.4 The Contract Schedule shall be submitted for approval in its optimum levelled form. This presentation may be in either a time scaled network or a bar chart form. It shall be subdivided into either work areas or systems as applicable.

4.5 Set up format to permit plotting of actual construction progress against scheduled progress.

4.6 The Contract Schedule shall include the following information:

.1 Commencement and completion dates of Contract;

.2 Commencement and completion dates of construction stages/phases, if any;

.3 Starting and ending dates of each activity/trade including the float periods. Major trades shall be further broken down as directed by Consultant; generally follow Specification format;

.4 Manpower requirements for each activity and log-in record to verify manpower. Log ins to be provided on a monthly basis;

.5 Order and delivery dates for major or critical equipment;

.6 Cost and resource loading;

.7 Interdependency with activities of other Contractors;

.8 Dates specified in the Contract Documents;

.9 Dates on which specific data will be required for submittal, i.e., Vendor data, shop drawings, samples, etc.

.10 Show projected percentage of completion of each activity as of the schedule status date.

.11 Indicate changes occurring since previous submission of the Contract Schedule including:
- .1 major changes in scope;
- .2 activities modified since previous submission;
- .3 revised projections of progress and start and finish dates of activities;
- .4 any anticipated changes to any Work Milestones; and
- .5 other identifiable changes.

.12 Any other information relating to orderly progress of Contract, considered by Contractor or Consultant to be pertinent.

4.7 This schedule shall be reviewed and updated monthly by the Contractor so as to reflect any Contract changes as well as major changes to the schedule.

5 DETAILED CONSTRUCTION SCHEDULE

5.1 Prepare and submit a detailed construction schedule using a critical path method ("CPM") network in a form approved by Owner within 14 days of final review and acceptance of the Contract Schedule.

5.2 This schedule, once reviewed and accepted by the Consultant, will be updated and submitted monthly with the Contract Schedule concurrently with application for monthly progress payment and weekly once the Contractor starts on Site. Consultant, together with Contractor, shall review construction progress once a month during or immediately following regular site meeting, or more often as directed by Consultant.

5.3 This schedule shall cover the construction period. It will show, in detail, activities on a daily basis indicating durations, manpower and constraints. The activities shown on this schedule shall further clarify or detail the activities shown on the Contract Schedule.

5.4 Submission of the draft Detailed Construction Schedule shall constitute the representation by the Contractor that:

.1 The Contractor has distributed the draft Detailed Construction Schedule to the Subcontractors for their review and comment;

.2 The Contractor has incorporated any other special conditions in planning the Work such as specified non-work periods, etc.;

.3 All work has been coordinated and scheduled to permit time for work associated with the cash allowances included as part of this Contract; and

.4 All work has been coordinated and scheduled to permit time for work associated with the alternatives included as part of this Contract.

5.5 Update construction schedule, whenever changes occur, in manner and at times acceptable to Consultant. Include with each update a written report of activity progress reflected in the revised critical path schedule, and the corrective actions which have been or are to be taken to maintain progress on the schedule in the future, anticipated delay, resource availability, schedule changes, and work to be completed in the next 2 month period.

5.6 The detailed construction schedule shall be presented in a bar chart form.

5.7 Plot actual construction progress on schedule at least once a week.

6 CASH FLOW CHART

6.1 Within 7 days after award of Contract, submit, in form approved by Consultant, cash flow chart broken down on a monthly basis in an approved manner. Cash flow chart shall indicate anticipated Contractor's monthly progress billings from commencement of work until completion.

6.2 Update cash flow chart whenever changes occur to scheduling and in manner and at times satisfactory to Consultant.

7 PREVENTATIVE ACTION REPORT

7.1 When a Work Milestone in the Contract Schedule is projected to be later than the date shown in the currently accepted Detailed Construction Schedule, the Contractor is required to provide a Preventative Action Report.

7.2 The Preventative Action Report is a written narrative that identifies and describes:

.1 the areas of Work affected;

.2 the reason(s) for the projected slippage;

.3 the potential impact on relevant Work Milestones;

.4 the potential overall impact on the Detailed Construction Schedule;

.5 the preventative action the Contractor intends to take to avoid or minimize the slippage; and

.6 the anticipated effectiveness of the planned preventative action.

7.3 The Preventative Action Report shall be issued to the Owner within ten (10) days of issuance of the Contract Schedule identifying the projected slippage.

8 CORRECTIVE ACTION REPORT

8.1 When a Work Milestone is not achieved on time relative to the date shown in the currently accepted Detailed Construction Schedule, the Contractor is required to provide a Corrective Action Report.

8.2 The Corrective Action Report is a written narrative that identifies and describes:

.1 the areas of Work affected;

.2 the extent of delay and the reason(s) for it;

.3 the impact on relevant Work Milestones;

.4 the overall impact on the Detailed Construction Schedule;

.5 the detailed corrective action the Contractor intends to take to address the slippage;

.6 the anticipated effectiveness of the recovery plan.

8.3 Appropriate corrective action may include, but not be limited to, assignment of additional labour, trade subcontractors or equipment, shift or overtime work.

8.4 The Corrective Action Report shall be issued to the Owner within ten (10) days of issuance of the Contract Schedule identifying the late intermediate Milestone.

END OF SECTION

1 GENERAL

1.1 Provide labour, Products, equipment, services tools and supervision necessary for submittals. Make submittals specified in this Section to Consultant unless otherwise specified.

.1 Verify accuracy and completeness of submittals prior to submission.

.2 Verify field measurements, field construction criteria, catalogue numbers and similar data.

.3 Co-ordinate each submittal with requirements of the Work and the Contract Documents.

.4 Notify Consultant in writing at time of submission, of any deviation in submittals from requirements of the Contract Documents.

1.2 Submittals Schedule:

.1 Provide schedule for submittal of all Shop Drawings, Product Data and Samples.
.2 Provide complete list of all manufactured products to be used in the course of the Work, including those amended by addenda.

1.3 Submit in accordance with dates established under Section 01 32 13 for shop drawings, fabrication, manufacture, erection and installation to provide adequate time for reviews, securing necessary approvals, possible revisions and resubmittals, placing orders, securing delivery and to avoid construction delays.

1.4 Accompany each submittal with a letter of transmittal in duplicate containing all pertinent information required for identification and checking of submittals including but not limited to the following:

.1 Date of initial submission and date of each subsequent submission if required.

.2 Project title and Consultant’s project number.

.3 Names of:
.1 Contractor.
.2 Subcontractor.
.3 Supplier/manufacturer/fabricator as applicable.

.4 Specification section numbers to which submission is related.

.5 Countersigned stamp of Contractor certifying that they have reviewed the submission.

1.5 Allow fifteen working days for the Consultant's review of each submission.

1.6 When submittals are resubmitted, transmit under a new letter of transmission.

1.7 Do not carry out Work until Consultants review of submittals has been completed.

1.8 Be responsible for payment of charges for delivery of submissions and resubmission to Consultant.

2 PRODUCT DATA

2.1 Before delivery of Products to the Site, submit Product data as specified in each section or as requested by the Consultant.

2.2 Submit manufacturer's Product data for systems, materials, and methods of installation proposed for use. Such literature shall identify systems, each component, and shall certify compliance of each component with applicable/specified standards.

2.3 Submit all Product Data Sheets in electronic copy (PDF) only, delivered via electronic means as directed by the Consultant.

3 SAMPLES

3.1 Before delivery of Products to the Site, submit samples of Products as specified or as requested by the Consultant. Label samples as to origin and intended use in the Work and in accordance with the requirements of the Specification Sections. Samples must represent physical examples to illustrate materials, equipment or work quality and to establish standards by which completed Work is judged.

3.2 Ensure samples are of sufficient size and quantity, if not already specified, to illustrate:

.1 The quality and functional characteristics of Products, including integrally related parts and attachment devices.

.2 The full range of colours available.

3.3 Notify the Consultant in writing, at time of submission, of any deviations in samples from requirements of the Contract Documents, and state the reasons for such deviations.

3.4 Identify samples with Project name, Contract number, date, Contractor's name, number and description.

3.5 If samples are not acceptable, both samples will be returned. If samples are acceptable, one sample will be so indicated and returned. Be responsible for the cost of samples that are not accepted and for resubmission of samples.

3.6 Acceptable samples shall serve as a model against which the products incorporated in the work shall be judged.

3.7 Each Product incorporated in the Work shall be precisely the same in all details as the acceptable sample.

3.8 Should there be any change to the accepted sample, submit in writing for approval of the revised characteristics and resubmit samples of the Product for approval if requested.

3.9 When samples are very large, require assembly, or require evaluation at the Site, they may only be delivered to the Site with approval and as directed.

4 SHOP DRAWINGS

4.1 Arrange for the preparation of Shop Drawings as called for in the Contract Documents or as may be reasonably requested by the Consultant. The Contractor and each Subcontractor shall operate as experts in their respective fields and all Shop Drawings and samples shall conform to the requirements of the Contract Documents.

4.2 The term "Shop Drawings" means drawings, diagrams, schematics, illustrations, schedules, performance charts, brochures and other data which are required to illustrate details of the Work.

4.3 In addition to Shop Drawings specified in the specification sections, submit Shop Drawings required by jurisdictional authorities in accordance with their requirements.

4.4 Shop Drawings for openings, sleeving, conduit and conduit boxes:

.1 Prior to preparation of Shop Drawings, coordinate sizes of all structural openings and sleeves with respective fabricators for mechanical ducting. Adjustments to the opening sizes indicated on the Contract Drawings shall not be made without the approval of the Consultant.

.2 Prior to detailing structural reinforcement on Shop Drawings, arrange for the Structural Engineer to review formed holes, recesses and sleeving. Completely dimension openings, recesses and sleeves and relate to appropriate grid line(s) and elevation(s).

.3 Prior to forming of the concrete slab, arrange for the preparation of Shop Drawings for review by the Consultant showing embedded conduit to be cast within slab. Shop Drawings shall include conduit from all sources.

.4 Prior to fabrication of the structure, arrange for the preparation of Shop Drawings for review by the Consultant showing exposed decorative conduits mounted onto structure. Shop Drawings shall include decorative conduits from all sources.

4.5 Shop Drawings shall indicate the following minimum criteria and any additional criteria indicated in the individual specification sections requiring Shop Drawings:

.1 Clear and obvious notes of any proposed changes from the Contract Documents.

.2 Fabrication and erection dimensions.

.3 Provisions for allowable construction tolerances and deflections provided for live loading.

.4 Details to indicate construction arrangements of the parts and their connections, and interconnections with other work.

.5 Location and type of anchors and exposed fastenings.

.6 Materials, physical dimensions including thicknesses, and finishes.

.7 Descriptive names of equipment.

.8 Mechanical and electrical characteristics when applicable.

.9 Information to verify that superimposed loads will not affect function, appearance, and safety of the work detailed as well as of interconnection work.

.10 Assumed design loadings, and dimensions and material specifications for load-bearing members.

4.6 Include in Shop Drawing submissions detailed information, templates, and installation instructions required for incorporation and connection of the Work.

4.7 Before submitting to the Consultant, review all Shop Drawings to verify that the Products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers and similar data and that it has checked and coordinated each Shop Drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each Shop Drawing shall be indicated by stamp, date and signature of a qualified person possessing the appropriate authorization from the Contractor.

4.8 Be responsible for dimensions, confirmed at the Site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the Work of all subtrades.

4.9 Submit Shop Drawings for the Consultant's review with reasonable promptness and in orderly sequence so as to cause no delay in the Work nor in the work of Other Contractors. At the time of submission, notify the Consultant in writing of any deviations in the Shop Drawings from the requirements of the Contract Documents. The Contractor will be held responsible for changes made from the Contract Documents which are not indicated or otherwise communicated in writing with the submission.

4.10 Drawings submitted by the Contractor as required herein are the property of the Owner who may use and duplicate such drawings where required in association with the Work.

4.11 Submit Shop Drawings signed and sealed by a licensed Professional Engineer registered in the place of the Work where indicated in individual Sections.

4.12 Shop Drawings shall have distinct, uniform letters, numerals and line thicknesses that will ensure the production of clear legible prints at original as well as reduced size.

4.13 Provide submissions in electronic Portable Document Format (PDF) format delivered via electronic means as directed by the Consultant.

4.14 Shop Drawings shall contain the following identification:

.1 Project name and Contract number.

.2 Applicable 6-digit Contract Specification number describing the item.

.3 Location (unit, level, room number, etc.).

.4 Name of equipment or Product.

.5 Name of Subcontractor or supplier/fabricator.

.6 Signature of Contractor certifying that Shop Drawing is in conformance with Contract Documents.

.7 On submissions subsequent to the first, the following additional identification:
.1 The revised submission number.
.2 Identification of the item(s) revised.

4.15 Dimensions and designations of elements shall be shown in the same system of measurement used on the applicable Contract Drawings.

4.16 The Consultant reserves the right to refuse acceptance of drawing submissions not meeting the above requirements.

4.17 The Consultant's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the Shop Drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the Shop Drawings has been approved in writing by the Consultant. Review does not mean that Consultant approves detail inherent in Shop Drawings, responsibility which shall remain with Contractor submitting same.

4.18 The Contractor shall make any changes in Shop Drawings which the Consultant may require consistent with the Contract Documents and re-submit unless otherwise directed by the Consultant. When re-submitting the Shop Drawings, the Contractor shall notify the Consultant in writing of any revisions other than those requested by the Consultant.

4.19 Only drawings noted for revision and resubmission need be resubmitted.

4.20 File one copy of each submitted Shop Drawing at the Site.

5 CERTIFICATES

5.1 Submit certificates that are required by authorities having jurisdiction or that are requested in the applicable specification sections.

5.2 Clearly show on each certification the name and location of the Work, name and address of Contractor, quantity and date of shipment and delivery and name of certifying company.

5.3 Certificates shall verify that Products and/or methods meet the specified requirements and shall include test reports of testing laboratories approved to validate certificates.

5.4 Submit certificates in duplicate (hard and soft) and signed by an authorized representative of the certifying company.

5.5 Submit electronic copies of certificates in PDF format, delivered via electronic means as directed by the Consultant.

6 CERTIFICATION OF TRADESMEN

6.1 Provide certificates, at the request of the Consultant, to establish qualifications of personnel employed on the Work where such certification is required by authorities having jurisdiction, by the Consultant or by the Contract Documents.

7 EXTENDED WARRANTIES

7.1 Submit extended warranties as requested in sections of the Specifications showing title and address of Contract, warranty commencement date and duration of warranty.

7.2 Extended warranties shall commence on termination of the standard warranty specified in the conditions of the contract and shall be an extension of these provisions. Clearly indicate what is being warranted and what remedial action is to be taken under the warranty. Ensure warranty bears the signature and seal of the Contractor.

7.3 Submit each extended warranty on a form that is acceptable to the Owner and Consultant.

8 INSPECTION AND TEST REPORTS

8.1 Submit inspection and test reports as specified in the Sections of the specifications for “Source Quality Control” and “Field Quality Control” within 3 working days of inspection or testing. If immediate action is required by the Contractor or Consultant inform the Consultant immediately and submit inspection and testing report within one working day.

8.2 Submit 3 copies of reports submitted with certificates of compliance indicating but not limited to the following:

.1 Project name and number.

.2 Date of inspection or test and date report is issued.

.3 Name and address of inspection and testing company.

.4 Name and signature of inspector or tester.

.5 Identification of Product and Specification Section covering inspected or tested work.

.6 Specified requirements for which the inspection or testing was performed and results of inspections or tests.

.7 Location of inspection or from which tested material was derived.

.8 Overview of inspection and testing methods and procedures.

.9 Remarks and observations on compliance with Contract Documents.

8.3 Inspection and test reports shall be signed by a responsible officer of the inspection and testing company.

9 PROGRESS PHOTOGRAPHS

9.1 Concurrently with monthly application for payment submit 2 CD's or DVD's of digital pictures illustrating the progress of the Work as follows:

.1 A minimum of 20 pictures that best illustrate the progress on the site.

.2 Submit progress photographs with each monthly progress draw, and at the following milestones;
- .1 Completion of buried services installation before backfilling,
- .2 Completion of demolition work,
- .3 Completion of excavation and pouring of footings,
- .4 Completion of footings or foundation work,
- .5 Completion of each floor of building structure,
- .6 Completion of exterior wall construction,
- .7 Completion of curtain walls, window, door and glazing work,
- .8 Completion of roofing,
- .9 Completion of interior partition work,
- .10 Completion of mechanical and electrical rough-in work,
- .11 Completion of each interior finish,
- .12 Completion of grading of parking lot,
- .13 Completion of asphalt and concrete paving,
- .14 Completion of landscaping.

.3 Pictures shall be in focus and properly illuminated; view shall be unobstructed.

.4 Pictures shall be taken with a minimum 5 megapixel camera or better such that quality and details can be discerned from photo.

.5 The Pictures shall either have an accurate date-stamp present in the photo, or be numbered and dated in the digital filename.

.6 The CD or DVD containing the photo's shall be labeled with the following information: The project name, the period the pictures are taken in, the monthly application number which the pictures are associated with.

10 **FINAL PHOTOGRAPHS**

.1 Submit CD or DVD copy of all progress photographs, organized by date, with Operations & Maintenance Manuals at the completion of the project.

.2 Orientation of Photographs: provide final photos as follows:
- .1 General viewpoints as defined above,
- .2 Views of all exterior elevations,
- .3 One view from each street,
- .4 Views of site showing parking areas,
- .5 Interior views of all major spaces.

11 **PROGRESS REPORTS**

11.1 Prepare a monthly progress report current to the last Friday of each month. The report shall indicate the period covered and include but not be limited to the following:

.1 Executive Summary.

.2 Areas of Concern/Action Required.

.3 Work Accomplished This Period.

.4 Work Planned Next Period.

.5 Schedule Status.

.6 Budget Status.

.7 Status of Submittals.

.8 Quality Control.

.9 Contract Changes.

.10 Outstanding Actions.

11.2 Submit the monthly progress report such that it is received by the Consultant no later than the Wednesday following the last Friday of the month, regardless of whether or not the Monday is a public holiday.

12 **MOCK-UPS**

12.1 Provide mock-ups in accordance with Section 01 40 00.

13 **OPERATION AND MAINTENANCE MANUALS**

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

14 RECORD DOCUMENTS

14.1 Submit record documents in accordance with Section 01 78 39.

15 ELECTRONIC FILE TRANSFER AGREEMENT

15.1 Refer to the 'Electronic File Transfer Agreement' as appended to this Section.

15.2 The electronic file transfer agreement must be completed and returned to the Consultant prior to transfer of electronic files.

END OF SECTION

Electronic Files Transfer Agreement

Architect of Record ("The Consultant"): Coolearth Architecture Inc. & CS&P Architects Inc.
Contractor ("The Contractor"):
Re ("The Owner"): Mount Dennis Childcare Centre

The Contractor hereby acknowledges requesting from the Consultant, electronic data containing the graphic (electronic) representation of the Architectural Drawings as per attached list of drawings, subject to the condition that the said drawings are to be used only for information and reference in connection with the Owner's use and occupancy of the Project. The Contractor shall be responsible for checking and verifying all dimensions, details, and quantities of materials and for the coordination of related elements as required to facilitate complete and accurate fabrication and installation. Any omissions or discrepancies shall be reported to the Consultant.

The Contractor hereby warrants to the Consultant that the files will be used solely for the development of shop drawings. The drawings shall not be used for any other purpose on this project and shall not be used on any other project either by the Contractor or by others. The Contractor further warrants not to alter the electronic data or the information contained therein, in any way except for the above-noted purposes, and acknowledges that such unauthorized use or alteration of the original work is protected in accordance with the Copyright Act and subject to the penalties prescribed therein.

The Contractor hereby acknowledges that the said electronic data contain information which may be updated or altered at any time by the Consultant, and that it is the responsibility of the Contractor to make themselves aware of these changes, in a timely manner. In the event of a conflict between the drawings issued to the Contractor and the sealed contract drawings, the sealed contract drawings shall govern.

The Contractor shall, to the fullest extent permitted by law, indemnify, defend and hold harmless the Consultant, and its sub-consultants from all claims, damages, losses, expenses, penalties and liabilities of any kind, including attorney's fees, arising out of, or resulting from the use of the electronic files by the Contractor, or by third party recipients of the electronic files from the Contractor.

The Consultant believes that no licensing or copyright fees are due to others on account of the transfer of the electronic files, but to the extent any are, the Contractor will pay the appropriate fees and hold the Consultant harmless from such claims.

Any purchase order number provided by the Contractor is for Contractor's accounting purposes only. Purchase order terms and conditions are void and are not a part of this agreement.

The laws of the Province of Ontario shall govern this agreement.

The conditions and undertakings expressed herein apply to partners, employees, agents, successors, assigns and legal or other representatives of the Contractor.

AUTHORIZED ACCEPTANCE

By Consultant

Signature

Print Name and Title

Date_____

By Contractor

Signature

Print Name and Title
(Authorized Signing Officer)

Date_____

1 CONSTRUCTOR

1.1 For the purposes of the Contract, the term "Constructor", as defined in the Occupational Health and Safety Act, shall mean the Contractor who shall be responsible for ensuring that the provisions of the statutes, regulations and by-laws pertaining to the safe performance of the Work are to be observed. The "Constructor" shall submit the Notice of Project.

1.2 In the event of conflict between any of the provisions of Statues, Regulations and By-laws, and other requirements of authorities, the most stringent provision applies.

1.3 the Contractor's representative shall be responsible for ensuring that the provisions of statutes, regulations and by-laws pertaining to safe performance of the Work and the work of Other Contractors and Owner's own forces working on the Site are observed and that the methods of performing the Work do not endanger the personnel employed thereon nor the general public, and are in accordance with the latest edition of the Occupational Health and Safety Act. Include on the Joint Health and Safety Committee representatives of Other Contractors working on Site.

1.4 Prior to the Contractor's representative being absent from the Site for an extended period during execution of the Work, the Contractor's representative will name, in writing to the Consultant, another person who is competent to assume these responsibilities. The Contractor shall advise the Consultant of change of the individual identified as the Contractor's representative.

1.5 At the discretion of the Consultant, the "Constructor" designation may be transferred to/from a Contractor at any time at no additional cost to the Owner.

2 PROJECT RESPONSIBILITIES

2.1 The Contractor's representative shall ensure that:

2.2 All measures and procedures prescribed by the following Acts and Regulations are carried out on Site:

.1 The Occupational Health and Safety Act;

.2 The Regulations for Construction Projects;

.3 WHMIS Regulations;

.4 The Environmental Protection Act and regulations,

.5 All other legislation, regulations and standards as applicable.

2.3 Every employer and every worker performing Work on the Site must comply with the requirements referred to above.

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

2.5 Temporary controls and facilities such as temporary hoarding, fencing and enclosures for protection of public and private property shall be provided in accordance with requirements of Section 01 50 00.

3 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

3.1 Be familiar with and comply with WHMIS regulations.

3.2 Properly label controlled products. Provide proper warning labels and training at the Site.

3.3 Maintain on site for duration of Contract a hazardous materials log containing all required MSDS. Log shall be open for inspection by Owner, Consultant and all personnel on Site.

3.4 Provide copies of material safety data sheets (MSDS) for any controlled products prior to delivery to the Site.

3.5 Be responsible for all applicable requirements of the regulations.

3.6 Before commencing any Work on Site, attend the pre-construction meeting and provide the Consultant with a proposal as to how hazardous materials will be stored and dispensed on Site. In addition, specifically outline the measures which will be undertaken to prevent damage or injury in the event of an accidental spill.

3.7 Provide "Handling Procedure for Hazardous Materials".

4 JOINT HEALTH AND SAFETY COMMITTEE

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

5 DELIVERABLES

5.1 The Contractor shall deliver to the Consultant:

.1 The Contractor's Occupational Health and Safety Policy.

.2 The Contractor's safety program to implement the Occupational Health and Safety Policy for the Contract, which will effectively prevent and control accidents for the Contract.

.3 A copy of all communications with, and including all orders by, the Ministry of Labour or other occupational health and safety enforcement authority.

.4 A copy of all accident/injury investigation reports, not just the WSIB Form 7. Each report must contain a statement of actions that will be taken to prevent a recurrence.

.5 A copy of all inspection reports made by the Contractor in compliance with the employer's responsibility under the Occupational Health and Safety Act.

.6 A copy of all safety information pertaining to the Contract made and furnished by the Contractor's own "Safety Personnel" or outside consultants/advisers engaged for the purpose of inspecting the workplace for occupational health and safety.

.7 A verification that all workers in the employ of the Contractor on Site, have had a WHMIS training or refresher course within the last twelve months.

.8 A verification that all workers in the employ of the Contractor have had "Explosive Activated Tool Training" on the type of tools being used.

.9 A verification that the instruction manuals are on Site for all tools and equipment being used.

.10 A copy of the most recent workers compensation experience rating account, i.e. CAD-7, NEER, and/or an insurance carrier's experience rating account.

.11 Statistical information for the purpose of determining injury frequency and severity rates (hours worked, first-aid injuries, medical aid injuries, lost time injuries, restricted workday injuries, near-miss accident/incident and significant occurrence data), in a timely manner as required by the Consultant.

.12 The immediate reporting to the Consultant of all instances that are defined in the Occupational Health and Safety Act as "Notices of Injuries" and "Occurrences" and any occasion that a worker exercises their "Right to Refuse Unsafe Work".

5.2 The Consultant reserves the right to require additional or amended deliverables pertaining to safety during the duration of the Work at no additional cost to the Owner.

5.3 Items specified above shall be delivered to the Consultant prior to the Contractor commencing Work on the Site.

6 DUE DILIGENCE

6.1 The Contractor acknowledges that it has read and understands the measures and procedures relating to occupational health and safety as prescribed above. The Contractor acknowledges and understands its duties as therein set out and hereby expressly undertakes and agrees to comply with all such requirements and standards in their entirety and at the Contractor's expense.

6.2 The Contractor further agrees to fully cooperate with all health and safety requirements, rules, regulations, standards and criteria set out in the Contract Documents, which agreement is in furtherance of the Contractor's duties and responsibilities under occupational health and safety legislation.

6.3 The Contractor agrees that if, in the opinion of the Consultant or Owner, the health and safety of a person or persons is endangered or the effective operation of the system put in place to ensure the health and safety of workers on the Site is not being implemented, the Consultant or Owner may take such action as it deems necessary and appropriate in the circumstances, including, without limitation, the following:

.1 Require the Contractor to remedy the condition forthwith at its own expense;

.2 Require that the Site be shut down in whole or in part until such time as the condition has been remedied;

.3 Remedy the problem and the Owner shall back-charge the Contractor for the cost of such remedial work, together with an appropriate overhead factor as determined by the Owner in its sole discretion; and

.4 Terminate the Contract without further liability in the event the Contractor fails to comply with these provisions.

6.4 If a lien is registered, in respect to any monies held back, back-charged or assessed in accordance with these paragraphs, the Contractor shall consent to an order vacating such registration and shall indemnify the Owner for any and all loss, whereby direct or consequential which the Owner may sustain as a consequence of such registration.

7 SITE SAFETY PERSONNEL

7.1 In the event the Consultant deems it necessary, because of the Work, the Contractor shall assign a "Competent Safety Person" to assist the Contractor's representative in the discharging of safety responsibility, at no additional cost to the Owner.

END OF SECTION

1 GENERAL

1.1 Be responsible for inspection and testing as required by the Contract Documents, statutes, regulations, by-laws, standards or codes or any other jurisdictional authority. Give the Consultant timely notice of the readiness for inspection, date and time for such inspection for attendance by the Consultant.

1.2 Verify by certification that specified products meet the requirements of reference standards specified in the applicable specification sections.

1.3 Conduct testing, balancing and adjusting of equipment and systems specified in applicable mechanical and electrical specifications sections by independent testing company.

2 INSPECTION AND TESTING BY THE OWNER

2.1 The Consultant, on behalf of the Owner may appoint an independent inspection and testing company to carry out inspection and testing of the Work for conformance to the Contract Documents. Such costs for inspection and testing will be paid by the Cash Allowance. However, any additional inspection and testing due to non-conformance to the Contract Documents shall be at the Contractor's expense.

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

2.3 The Owner may inspect and test Products during manufacture, fabrication, shop testing, installation, construction and testing phases of the Contract. The Consultant will ascertain the quantity and quality of testing to be performed. Inspection and testing may be performed at the place of manufacture/fabrication, storage, or at the Site as designated by the Consultant. Where inspection and testing is done either during manufacture, fabrication, or at Site, ensure that proper facilities and assistance are provided.

3 INSPECTION AND TESTING

3.1 Source and Field Quality Control specified in Other Sections:

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

.2 Do not include in work of this Section responsibilities and procedures that relate solely to an inspection and testing company's functions that are specified in another Section which is paid for directly by the Owner. Such information is included in this Section for Contractor's information only.

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

4 QUALIFICATIONS OF INSPECTION AND TESTING COMPANIES

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

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

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

5 RESPONSIBILITIES OF THE CONTRACTOR

5.1 Be responsible for quality control methods and procedures to ensure performance of the work in accordance with the Contract Documents.

6 RESPONSIBILITIES OF INSPECTION AND TESTING COMPANIES

6.1 Determine from specifications and Drawings the extent of inspection and testing required for Work of the Contract. Subcontractors shall notify Consultant of any omissions or discrepancies in the work inspected and/or tested.

6.2 Perform applicable inspection and testing described in the Specifications and as may be additionally directed.

6.3 Provide competent inspection and testing personnel when notified by the Contractor that applicable work is proceeding. Inspection personnel shall cooperate with the Consultant and Contractor to expedite the Work.

6.4 Subcontractors shall notify the Consultant and Contractor of deficiencies and irregularities in the Work immediately when they are observed in the course of inspection and testing.

6.5 Inspection and testing companies shall not perform or supervise any of the Contractor's work, and shall not authorize:

.1 Performance of work that is not in strict accordance with the Contract Documents.

.2 Approval or acceptance of any part of the Work.

7 ACCESS TO WORK

7.1 Allow inspection & testing companies access to the Work, as well as off site manufacturing and fabrication plants.

8 INSPECTION AND TESTING PROCEDURES

8.1 Perform specified inspection and testing only in accordance with specified reference standards, or as otherwise approved.

8.2 Observe and report on compliance of the Work to requirements of Contract Documents.

8.3 Submit three copies of inspection and test reports to the Consultant.

8.4 Ensure that inspectors are on site or at fabricator's operations for full duration of critical operations, and as otherwise required to determine that the Work is being performed in accordance with the contract Documents.

8.5 Identify samples and sources of materials.

8.6 Review and report on progress of the work. Report on count of units fabricated and inspected at fabricator's operations.

8.7 Observe and report on conditions of significance to work in progress at time of inspection or at fabricator's operations. Include where applicable and if critical to the work in progress:

.1 Time and date of inspection.

.2 Temperature of air, materials, and adjacent surfaces.

.3 Humidity of air, and moisture content of materials and adjacent materials.

.4 Presence of sunlight, wind, rain, snow and other weather conditions.

8.8 Include in reports all information critical to inspection and testing.

8.9 Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

8.10 Submit one copy of inspection and test reports to the Building Official having jurisdiction, where required by that official.

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

8.12 Ensure that only materials from the work and intended for use therein are tested.

8.13 Determine locations for work to be tested.

8.14 Refer to Section 01 21 00 for list of trades to undergo inspection and testing procedures. Refer to general requirements as specified in this Section.

9 **EARTHWORK (SOIL AND FILL COMPACTION AND SUBGRADE WORK)**

9.1 All earthwork shall be subject to inspection and testing as specified herein. Inspection and testing shall include:

.1 Inspection of excavations for foundations.

.2 Inspection of subgrade and granular fill materials.

.3 Inspection of backfill operations.

.4 Inspection and testing of backfill compaction.

.5 Inspection of trenching & bedding associated with underground services.

.6 Inspection and testing of fill & compaction associated with underground services.

10 **CAST-IN-PLACE CONCRETE AND REINFORCEMENT**

10.1 All cast-in-place concrete and reinforcement shall be subject to inspection and testing as specified herein for items such as footings, foundations, slabs, curbs, and walks. Inspection and testing shall include:

.1 Verification of materials delivered to site.

.2 Slump tests.

.3 Sampling of cylinders, and compressive strength tests.

11 **ASPHALT PAVING**

11.1 All asphalt paving shall be subject to inspection and testing as specified herein. Inspection and testing shall include:

.1 Inspection and compaction testing of all granular base courses.

.2 Marshal Density testing of asphalt material.

.3 Compaction testing of all courses of asphalt paving.

12 **STRUCTURAL STEEL**

12.1 All structural steel shall be subject to inspection and testing as specified herein. Inspection and testing shall include:

.1 Confirmation that materials supplied meet specifications.

.2 Shop inspection during fabrication of steel.

.3 Checking welders' CWB Certification.

.4 Checking fabricated members against design member shapes.

.5 Checking fabricated members against allowable sweep and camber.

.6 Checking fabricated members against specified camber.

.7 Visual inspection of all welded connections including spot checking of joint preparation and fit-up.

.8 Non-destructive testing of welding.

.9 Sample checking that tolerances are not exceeded during erection including fit-up of field welded joints.

.10 Inspection of field cutting.

.11 Inspection and testing of all field bolted connections.

.12 Visual inspection of all welds securing steel deck to structural steel.

.13 Visual inspection of all bearing plate locations.

13 WOOD DECK

13.1 All wood deck shall be subject to inspection and testing as specified herein. Inspection and testing shall include:

.1 Confirmation that materials supplied meet specifications.

.2 Shop inspection during fabrication of wood deck.

.3 Sample checking that tolerances are not exceeded during erection.

.4 Inspection of field cutting.

.5 Inspection and testing of all field bolted connections.

.6 Visual inspection of securing wood deck to structural steel.

14 WOOD TIMBER CONNECTIONS

14.1 All wood timber connections shall be subject to inspection and testing as specified herein. Inspection and testing shall include:

.1 Confirmation that materials supplied meet specifications.

.2 Inspection and testing of installed timber connections.

15 **AIR AND VAPOUR CONTROL LAYER**

15.1 All building envelope air and vapour control layer components shall be subject to inspection and testing as specified herein. Inspection and testing shall include:

.1 Visual inspection of total membrane for defects.

.2 Visual inspection of all sheet and transition membranes.

.3 Mil thickness testing of liquid air barrier membrane (where specified).

.4 Pull test to verify adhesion.

16 **CEMENTITIOUS FIREPROOFING**

16.1 All cementitious fireproofing and intumescent fireproof coatings shall be subject to inspection as specified herein. Inspection and testing shall include:

.1 Inspection of cementitious fireproofing and intumescent fireproof coatings to verify compliance with specifications.

.2 Inspection of cementitious fireproofing and intumescent fireproof coating applications.

17 **WINDOWS, CURTAIN WALLS, ENTRANCES AND GLAZING**

17.1 All exterior window frames, curtain wall entrance frames and glazing shall be subject to inspection and testing as specified herein. Inspection and testing shall include:

.1 Inspection of all components and materials to verify compliance with specifications.

.2 Inspection of all framing installation methods, including fastenings, required reinforcement, sills and trim, air barrier tie-ins, and sealant applications.

.3 Inspection of glazing methods, materials and installation.

18 **WATERPROOFING AND DAMPPROOFING**

18.1 All waterproofing and dampproofing shall be subject to inspection as specified herein. Inspection and testing shall include:

.1 Inspection of all waterproofing and dampproofing materials to verify compliance with specifications.

.2 Inspection of waterproofing and dampproofing applications.

19 **ROOFING**

19.1 All roofing shall be subject to inspection as specified herein. Inspection and testing shall include:

.1 Inspection of all roofing materials to verify compliance with specifications.

.2 Inspection of roofing applications.

.3 Minimum one(1) test cut per roofing area.

20 **BLOWER DOOR TESTING OF BUILDING ENVELOPE**

.1 The Contractor will be responsible to assist, provide labour and materials necessary for and during implementation of the blower door test under the Base Bid Contract, not the cash allowance. The blower door test will be administered by the Owner's forces and agent. The Contractor will be responsible to assist on additional testing until the criteria has been achieved.

.2 Refer to Section 07 27 01 for detailed requirements regarding blower door testing.

21 **TOLERANCES FOR INSTALLATION OF WORK**

21.1 Unless specifically indicated otherwise, work shall be installed plumb, level, square and straight.

21.2 Unless acceptable tolerances are otherwise specified in specification sections or are otherwise required for proper functioning of equipment, site services, and mechanical and electrical systems:

.1 "Plumb and level" shall mean plumb or level within 1 mm in 1 m.

.2 "Square" shall mean not in excess of 10 seconds lesser or greater than 90 degrees.

.3 "Straight" shall mean within 1 mm under a 1 m long straightedge.

.4 "Flush" shall mean within:

.1 6 mm for exterior concrete, masonry, and paving materials.
.2 1 mm for interior concrete, masonry, tile and similar surfaces.
.3 0.05 mm for other interior surfaces.

21.3 Allowable tolerances shall not be cumulative.

22 **REFERENCE STANDARDS**

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

23 **DEFECTS**

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

24 **MOCK UPS**

24.1 Mock-up schedule:

.1 Two weeks following award of Contract, provide a mock-up schedule in Microsoft Excel format as required for Work of this Project for the Consultant's review and approval.

.2 As required in individual specification sections, prepare a schedule indicating mock-ups required for the Work.

.3 Submitted schedule for mock-ups for each trade must be strictly adhered to.

24.2 Where required by Contract Documents construct, unless indicated herein, mock-ups of work on Site, in size and at location directed by Consultant.

24.3 Construct mock-ups prior to start of affected work. Allow sufficient time for Consultant's review. Work affected by mock-ups may not commence prior to acceptance of mock-ups.

24.4 Construct mock-ups to include all related specified materials and workmanship. Make revisions as directed by Consultant, in accordance with the intent of the Contract Documents, until mock-ups are acceptable.

24.5 Mock-ups, reviewed and accepted by Consultant, shall become the standard of quality against which installed work will be measured.

24.6 Mock-ups, by prior arrangement, may be incorporated into finished work if approved by Consultant only.

25 **EXTERIOR WALL MOCK-UP**

25.1 For exterior wall elements, construct a 3 m^2 mock-up of wall system incorporating all wall components specified, such as but not limited to air and vapour control layer transitions to I-beams, mullions and transition from wall to roof. Construct mock-up on Site in a location acceptable to Consultant. Experienced worker mastering air and vapour control layer shall be assigned the role to oversee, execute and report any issues regarding the air and vapour control layer.

25.2 The mock-up shall include the work of all trades involved in exterior wall elements, complete in all respects including air and vapour control layers, fibre cement cladding, aluminum work, sealants, etc., and shall establish a minimum standard for the work of the exterior wall elements, clear up any misunderstandings and point out any possible problems.

25.3 Upon completion of mock-up, and after being notified by the Contractor, Consultant and/or inspection and testing agency will inspect mock-up and if necessary prepare and issue a list of deficiencies. Once mock-up has been accepted, it will form the minimum standard of quality for exterior wall elements.

25.4 Mock-up will not form part of the work and will be independent of building. Remove and dispose of mock-up from Site during final cleanup, or when directed by Consultant.

26 **DOCUMENTS ON SITE**

26.1 Maintain at job site, one copy of each of the following:

.1 Contract Documents including Drawings, Specifications, Addenda, and other modifications to the Contract.

.2 'Reviewed' or 'Reviewed as Modified' Shop Drawings.

.3 Project Construction and Shop Drawing Schedules.

.4 Site Instructions and Change Orders.

.5 Field Test Reports.

.6 Reports by Authorities having Jurisdiction.

.7 Building and other applicable permits.

.8 Daily log including:
- .1 Weather conditions.
- .2 Excavation conditions
- .3 Start and finish date of each Trade Contractor.
- .4 Erection and removal dates of formwork.
- .5 Date, quantities and particulars of each concrete pour.
- .6 Dates and quantities and particulars of roofing and waterproofing and dampproofing work.
- .7 Visits to the Site by Owner, Consultants, Jurisdictional Authorities, Testing and Inspection companies, and material and equipment supplier representatives.

.9 Material Safety Data Sheet pursuant to WHMIS (Occupational Health & Safety Act).

.10 As-built drawings recording as-built conditions, instructions, changes for structure, equipment, wiring, plumbing, etc., as called for in Section 01 78 39 and Divisions 22 and 26, prior to being concealed.

.11 Copies of applicable codes.

26.2 The above material shall be made available to the Consultant at their request.

27 **BUILDING ENVELOPE**

27.1 Requirements specified herein apply to all elements of the exterior building envelope.

27.2 Continuity of air barrier/vapour retarder and insulation components is critical and must be maintained at all locations. Where different systems meet, ensure proper interface and continuity between adjacent components by implementing suitable construction sequences and by using compatible materials only.

27.3 Anchor exterior cladding components to structure in manner suitable to accommodate structural deflection and creep and to withstand loads from expected temperature gradients. Design anchorage to withstand expected wind loads, positive and negative, in accordance with applicable regulations. Anchors must not interfere with air and vapour control layer. Air tight seals at anchors must be approved by the Consultant.

27.4 Ensure that air spaces within exterior building components are firestopped in accordance with applicable regulations.

27.5 Ensure that air spaces on the outside of vertical air barrier/vapour retarder (walls), window systems, and curtain wall systems are constructed with adequate drainage provisions to the exterior.

27.6 Owner may complete a thermographic scan upon completion of the building envelope. Contractor will be responsible to correct identified thermal anomalies.

28 **DRAINAGE**

28.1 Layout and construct work to ensure that positive drainage is provided to floor drains, ditches, site drains and catch basins, as set in their final position, preventing undrained areas and ponding.

28.2 Ensure that allowable construction tolerances and structural deflection do not cause ponding of water.

28.3 Report to Consultant in writing prior to executing work affected, in case adequate drainage cannot be provided.

END OF SECTION

1 GENERAL

1.1 Provide Labour, Products, equipment, services, tools and Supervision to ensure that Work complies with minimum acceptable standards of materials and performance of Work in accordance with codes and standards referenced in the Specification.

1.2 Consider contract forms, codes, Specifications, standards, manuals, and installation and application instructions referred to in these specifications to be the latest published editions at the date of submission of the bid unless otherwise stated in the Specifications or otherwise required by the authorities having jurisdiction.

2 BY-LAWS, PERMITS, AND FEES

2.1 The Ontario Building Code - Ontario Regulation 332/12, including all amendments, shall govern the construction of the Work.

2.2 Comply with all By-Laws and regulations of authorities having jurisdiction. These codes and regulations constitute an integral part of the Contract Documents.

2.3 Owner shall apply and pay for Municipal Building Permit, and Contractor shall obtain and pay for all other permits, licenses, deposits, and certificates of inspection as part of the Contract Price as per Conditions of the Contract. Ensure that permits, licenses, deposits, and certificates included under specific Sections are provided as specified.

2.4 If required, pay for construction damage deposit required by authorities having jurisdiction.

2.5 Where permits, licences, and inspection fees are required by authorities having jurisdiction for specific trade functions, they shall be obtained by particular subtrade responsible for that work.

2.6 Arrange for inspection, testing of Work and acceptance required by the authorities having jurisdiction. Be responsible for necessary preparations, provisions and pay all associated costs.

2.7 Be responsible for ensuring that no work is undertaken which is conditional on permits, approvals, reviews, licences, fees, until all applicable conditions are met. No time extension will be allowed for delay in obtaining necessary permits.

2.8 Any additional work or changes to the materials due to Work not complying with the Ontario Building Code and Regulations as indicated by the Building Inspector shall be changed. All costs involved shall be borne by Contractor.

2.9 Obtain permit required to work on Municipal rights of way. Provide damage deposits for sidewalks, roads and services work, as applicable.

2.10 Give notice of completion of project prior to occupancy, as required by applicable legislation.

3 EXISTING PUBLIC SERVICE LINES

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

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

4 CODES

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

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

5 STANDARDS

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

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

5.3 If there is question as to whether a material, product or system is in conformance with applicable standards, the Consultant reserves the right to have such materials, products or systems tested to prove or disprove conformance. The cost for such testing will be paid by the Owner in the event of conformance with contract Documents or by the Contractor in the event of non-conformance.

5.4 Where application, installation and workmanship standards are cited, it is intended that referenced standards form the basis for minimum requirements of the specified item and specifications supplement the standards unless specified otherwise.

5.5 Matters may be dealt with in part by these specifications which are also dealt with, under the same or similar headings in cited standard. It is not intended that these specifications take the place of the standards but supplement them, unless specified otherwise.

5.6 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.

5.7 Where standards, specifications, associations, and regulatory bodies are listed in the Specifications by their abbreviated designations. These are but not limited to the following:

AA	The Aluminum Association
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association
AIEE	American Institute of Electrical Engineers
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
AMEU	Association of Municipal Electric Utilities
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWMAC	Architectural Woodwork Manufacturers Association of Canada
AWWA	American Water Works Association
CEMA	Canadian Electrical Manufacturer's Association
CGA	Canadian Gas Association
CGSB	Canadian General Standards Board
CISC	Canadian Institute of Steel Construction
CMHC	Canadian Mortgage and Housing Corporation
CMPA	Canadian Paint Manufacturers Association
COFI	Council of Forest Industries of British Columbia
CRCA	Canadian Roofing Contractors Association
CSA	Canadian Standards Association
CSSBI	Canadian Sheet Steel Building Institute
CWB	Canadian Welding Bureau
CWC	Canadian Wood Council
EEMAC	Electrical and Electronic Manufacturers Association Canada
FM	Factory Mutual
IEEE	Institute of Electrical and Electronic Engineers
MFMA	Maple Flooring Manufacturers Association
MIL	Military Standards
MSS	Manufacturer's Standardization Society
MTO	Ministry of Transportation Ontario
NAAMM	National Association of Architectural Metal Manufacturers
NFPA	National Fire Protection Association

NEMA	National Electrical Manufacturer's Association (U.S.A.)
NLGA	National Lumber Grades Authority
NRC	National Research Council of Canada
OCBA	Ontario Concrete Block Association
OHESC	Ontario Hydro Electrical Safety Code
OPSS	Ontario Provincial Standard Specification
PEI	Porcelain Enamel Institute
PDI	Plumbing Drainage Institute
PHA	Public Health Act
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
TEMA	Tubular Exchange Manufacturer's Association
TTMAC	Terrazzo, Tile and Marble Association of Canada
UL	Underwriters Laboratories Inc. (U.S.)
ULC	Underwriters Laboratories of Canada

6 FIRE RATINGS, ASSEMBLIES AND SEPARATIONS

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

.1 Underwriters' Laboratories of Canada.

.2 Underwriters' Laboratories Inc.

.3 Factory Mutual Laboratories.

.4 The National Research Council of Canada.

.5 The National Board of Fire Underwriters.

.6 Intertek Testing Services.

6.2 Where reference is made to only one testing authority an equivalent fire rating as determined or listed by another of the aforementioned testing authorities is acceptable if approved by authorities having jurisdiction. Obtain and submit such approval of authorities, in writing when requesting acceptance of a proposed equivalent rating or test design.

6.3 Fire rated door assemblies shall include doors, frame, anchors, fire rated glazing and hardware and shall bear label of fire rating authority showing opening classification and rating.

6.4 Material having a fire hazard classification shall be applied or installed in accordance with fire rating authorities printed instructions.

6.5 Fire rated assemblies shall be constructed in accordance with applicable fire test report information issued by fire rating authority. Deviation from fire test report will not be allowed.

6.6 Construct fire separations as continuous, uninterrupted elements except for permitted openings. Extend fire rated walls and partitions from floor to underside of structural deck above.

6.7 Fire separations may be pierced by openings for electrical and similar service outlets provided such boxes are non-combustible and are tightly fitted and sealed with a ULC approved sealant for the assembly being sealed.

6.8 Construction that abuts on or is supported by a non-combustible fire separation shall be constructed so that its collapse under fire conditions will not cause the collapse of the fire separation.

6.9 Do not use combustible members, fastenings, attachments and similar items to anchor electrical, mechanical or other fixtures to fire separations.

6.10 At penetration through fire rated walls, ceilings or floors, completely seal voids with ULC approved firestopping material; full thickness of the construction element. In locations that require a smoke seal, provide appropriate ULC approved system installed in accordance with the manufacturer's recommendations.

END OF SECTION

1 TEMPORARY CONTROLS

1.1 Hoarding, fencing and barriers:

.1 Before commencing operations, supply, erect and maintain minimum 1800 mm high plywood hoarding around perimeter of south and west end of Site adjoining with adjacent properties to protect public and private property from injury or damage. Paint outside of hoarding in a colour selected by the Consultant and mark with "POST NO BILLS" signs.

.2 Before commencing operations, supply, erect and maintain Consultant approved chain link or wire fence 1800 mm high around perimeter of north and east end of Site adjoining with adjacent properties to protect public and private property from injury or damage.

.3 Provide temporary enclosures as required to protect the building in its entirety or in its parts, against the elements, to maintain environmental conditions required for work within the enclosure, and to prevent damage to materials stored within.

.4 Provide lockable gates through hoarding, fencing and barriers for access to Site by workers and vehicles.

1.2 Prevent unauthorized entry to the Site. Barricade, guard or lock access points to the satisfaction of the Consultant and post "NO TRESPASSING" signs.

1.3 Provide hoarding, barriers and covered walkways required by governing authorities for public safety, public rights-of-way and for access to buildings. Snow fencing is not allowed as protection for sidewalk.

1.4 Install signs for movement of people around Work Site as required and directed by the Consultant.

1.5 Provide secure, rigid guide rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs as required for protection of Work, workers, and the public.

1.6 Remove hoarding, fencing, barriers, building enclosures, guide rails and barricades upon Contract Completion unless otherwise noted on the Contract Drawings or as directed by the Consultant.

2 SERVICE AND UTILITY SYSTEMS

2.1 Consult with utility companies and other authorities having jurisdiction to ascertain the locations of existing services on or adjacent to site.

2.2 Information as to the location of existing services, if shown on the Drawings, does not relieve the Contractor of his responsibility to determine the exact number and location of existing services.

2.3 Give proper notices for new services as may be required. Make arrangements with authorities and utilities for service connections required.

2.4 Pay any charges levied by utilities or authorities for work carried out by them in connection with this Contract, unless specified otherwise.

2.5 Operate and maintain all utility systems affected by work of this Contract, until the building or specific portions thereof have been accepted by the Owner.

2.6 Report existing unknown services encountered during excavation to Consultant for instructions; cut back and cap or plug unused services. Be responsible for the protection of all active services encountered and for repair of such services if damaged.

3 SCAFFOLDING, HOISTS AND CRANES

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

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

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

4 TEMPORARY WORKS

4.1 Installation and Removal: Provide temporary utilities, facilities and controls in order to execute the Work expeditiously. Remove from Site all such Work after use.

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

4.3 Pay all costs for temporary works consumed prior to Contract Completion.

4.4 Temporary Power and Lighting Systems:

.1 Supply, install and maintain electrical power and necessary electrical equipment including overhead and underground feeders, transformers, motors, starters, panels, protective devices and equipment.

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

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

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

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

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

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

.5 Make all necessary arrangements for and pay all costs for a temporary electrical service of sufficient capacity to supply temporary lighting, operation of power tools, cranes and equipment for all construction, implementation, and inspection and testing purposes. Supply and install necessary temporary cables and other electrical equipment and make all temporary connections as required.

.6 Temporary power distribution wiring shall comply with Ontario Hydro Electrical Safety Code. Obtain inspection certificates for temporary electrical work.

.7 Maintain the lighting systems in operation during the life of the Contract. Replace burned or missing lamps immediately.

.8 Upon Contract Completion, remove electrical plant and temporary lighting from the Site.

4.5 Water Supply:

.1 Provide and pay for a continuous supply of potable water for construction use. Provide as a minimum one water connection on each floor level.

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

4.6 Temporary heating:

.1 Provide temporary heating required during construction period as required to maintain the Contract Schedule (such as for winter heat during cold seasonal months), including attendance, maintenance and fuel.

.2 Construction heaters used inside buildings must be vented to the outside or be flame less type. Solid fuel salamanders are not permitted.

.3 Maintain temperatures of minimum 10°C in areas where interior and exterior construction is in progress unless otherwise indicated in the Contract Documents. Protect exposed and adjacent services from freezing. Repair at no cost to the Owner any such services, buildings or other utilities disrupted by freezing.

.4 Ventilate heated areas and keep structures free from exhaust combustion gases.

.5 The permanent heating system of the building or portions thereof may be used when available only upon written permission by Consultant, unless otherwise specified. If permission to use heating system is obtained:

.1 Before using air handling systems, ensure that dust/debris is removed from the premises and install temporary filters to prevent construction dust/debris from entering via return air or intake openings. keep unused ducts sealed to prevent entry of dust/debris. Replace filters frequently during construction.

.2 On competition of work remove temporary filters and install new filters in accordance with Division 23. After temporary use of air handling system is complete and before turning over system to Owner, vacuum internally to ensure all dust/debris is removed.

.3 Use of the buildings permanent heating and ventilation system will not be permitted while work that generates fine dust, such as gypsum wallboard sanding is in progress.

4.7 Elevators: Elevators may not be used by construction personnel.

4.8 Temporary Telephone and facsimile: Provide and pay for separate telephones and facsimile services, for local call only, as required for own use and use of the Consultant and Owner. Long distance call shall be paid by party making call.

4.9 Sanitary Facilities: Provide sanitary facilities in accordance with occupational health and safety requirements in the place of the Work. Use of new sanitary facilities is not allowed.

5 PROTECTION

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

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

5.3 Protection of Building Finishes and Equipment:

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

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

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

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

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

5.4 Fire Protection:

.1 Take precautions to prevent fires. Provide and maintain temporary fire protection equipment of a type appropriate to the hazard anticipated in accordance with authorities having jurisdiction, governing codes, regulations, by-laws and to the satisfaction of the Consultant and insurance authorities.

.2 Excessive storage of flammable liquids and other hazardous materials is not allowed on Site. Flammable liquids must be handled in approved containers. Remove combustible wastes frequently.

.3 Inspect temporary wiring, drop cords, extension cables for defective insulation or connections frequently.

.4 Open burning of rubbish is not permitted on the Site.

.5 Handle, transport, store, use and dispose of gasoline, benzine or other flammable materials with good and safe practice as required by authorities having jurisdiction.

.6 Provide fire extinguishers of the non-freezing chemical type in each temporary building, enclosure and trailer. Use only fire-proofed tarpaulins.

.7 A fire watch shall be required for each of the following activities regardless of the number, duration or size of the activity in operation:
.1 any open flame activities(e.g., soldering and welding);
.2 shutdown of fire detection system;
.3 shutdown of sprinkler system.

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

5.6 Report any discharge of a contaminant to the authorities having jurisdiction.

6 **PEST CONTROL**

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

7 **FIRST-AID FACILITIES**

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

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

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

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

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

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

9 **PROJECT IDENTIFICATION**

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

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

9.3 Provide signs on every room with an exterior assembly stating "AIR-TIGHT BUILDING. NO DRILLING - NO CUTTING THE EXTERIOR ENVELOPE". Sign shall also include an image showing a drill and cross with a red cross indicating that such is not permitted for this Work.

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

10 **SITE MAINTENANCE**

10.1 Maintain the Site and adjacent premises in a clean and orderly condition, free from debris and other objectionable matter. Immediately remove rubbish and surplus Products, equipment and structures from the Site. If the Site is not cleaned (within 48 hours after the Contractor has been instructed to do so), the Consultant may clean the Site and retain the cost from monies due, or to become due, to the Contractor.

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

11 **SITE STORAGE AND OVER LOADING**

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

11.2 Products shall be stored only in areas designated or approved by the Consultant, and shall not be left lying on streets, sidewalks, boulevards or elsewhere within public view. Products which the Consultant may permit to be stored elsewhere than in the Contractor's storage areas shall be neatly stacked or otherwise disposed and shall be so maintained.

11.3 Fabrication shops shall not be set up within the structure except as directed by or with the permission of the Consultant.

11.4 Do not load or permit to be loaded any part of the Work with a weight or force that it is not calculated to bear safely. Be solely responsible and liable for damages resulting from violation of this requirement. Provide temporary supports as strong as permanent support.

11.5 Do not cut, drill or sleeve load bearing members unless shown on drawings or otherwise approved by the Consultant in writing for each location.

11.6 Site storage and loading requirements to be in accordance with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.

12 **PUBLIC CONVENIENCE AND SAFETY**

12.1 Maintain sidewalks at and adjacent to the Site in a safe condition throughout the Contract. Promptly remove ice and snow.

12.2 Keep haul routes free at all times from Products spilled on highway or street surfaces and clean highways and streets of deposits due to performance of the Work to the satisfaction of the Consultant and the highway and street authorities. Clean highways and streets within 24 hours of Consultant's instruction.

12.3 The Consultant may inspect haul routes, the Site and adjacent premises daily and may halt operations, withhold payment or carry out such additional operations as necessary, deducting the cost from monies due, or to become due, to the Contractor.

13 **ACCESS AND EGRESS TO SITE**

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

14 **PUBLIC TRAFFIC FLOW**

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

15 **PUBLIC UTILITIES AND SERVICES**

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

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

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

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

16 **ROADS, CURBS, GUTTERS, AND WALKS**

16.1 Include all curb cuts and making good of existing curbs, walks and paving on Municipal property to provide fully paved and finished approaches to requirements of authorities having jurisdiction.

17 **CONSTRUCTION PARKING**

17.1 Parking will be permitted on Site provided it does not disrupt the performance of Work, Site safety, movement of vehicular or pedestrian traffic and/or damage completed Work.

18 **SITE VISITORS**

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

18.2 Ensure Site visitors wear appropriate safety apparel.

19 **EROSION AND SEDIMENTATION CONTROL**

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

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

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

19.4 Provide storm drain inlet protection consisting of a sediment control barrier or an excavated ponding area around storm drain inlet or curb inlet; add bracing where necessary to withstand high flow volumes and depth. Inspect inlet protection after each rainfall and repair damage. Sweep up accumulated sediment and dispose of in a controlled area. Remove inlet protection after area has been stabilized with permanent vegetation.

19.5 Prevent tracking of mud and dirt from site onto paved roads. Provide stabilized vehicle access/egress points, constructed of coarse granular material. Place additional granular material as required to maintain access/egress points in proper working order. Clean mud and dirt from paved roads at end of each day by shoveling or sweeping and subsequent washing. Dispose of mud dirt in a controlled disposal area.

20 **TEMPORARY DRAINAGE AND DEWATERING**

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

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

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

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

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

21 **SNOW REMOVAL**

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

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

22 **POLLUTION (DUST, DEBRIS, AND NOISE) CONTROL**

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

22.2 Keep premises free of waste material.

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

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

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

22.6 Control emissions from equipment and plant to local authorities emission requirements.

22.7 Prevent abrasive-blasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

23 **TREE PROTECTION**

23.1 Within Contractor's assigned work and storage areas and adjacent to designated access routes, protect existing trees and other plants scheduled to remain. Provide minimum 1.8 m high chain link fencing outside of dripline of trees or groups of trees and other plants.

23.2 Leave fenced areas undisturbed; do not use areas for storage, stockpiling or any other purpose. Do not dump or flush any contaminants in areas of tree feeder roots.

23.3 Do not attach rigging cables to trees.

23.4 Where limbs or portions of plants are required to be removed to accommodate new work, they shall be removed in accordance with accepted arboricultural practice.

23.5 Where root systems of protected trees adjacent to construction are exposed or damaged, they shall be neatly trimmed and the area backfilled with suitable material to prevent desiccation.

23.6 Where necessary give plants an overall pruning to restore the balance between roots and top growth and/or to restore appearance.

23.7 Except at locations where specific procedures are included in Contract Documents do not alter grades around existing trees/plants without first obtaining Consultant's consent and directions.

END OF SECTION

1 SPECIFIED PRODUCTS

1.1 Work of this Contract is based on Products specified by:

.1 Manufacturer's catalogued trade names and/or;

.2 References to standards (i.e. CAN, CGSB, CSA, ASTM) or;

.3 Prescriptive Specifications or;

.4 Performance Specifications.

1.2 When one or more manufacturer's trade name is specified for a Product, any one of the specified Products will be acceptable. Products by other manufacturers are subject to the Consultant's acceptance as an equivalent substitution in accordance with the specified requirements of substitutions.

1.3 When more than one manufacturer's catalogued trade name Product is specified along with a referenced standard, any one of the specified Products will be acceptable on condition the Product complies with the referenced standard.

1.4 When a Product is specified by reference to a standard only, the Contractor may select any Product that meets or exceeds the specified standard for the intended purpose. The onus shall be on the Contractor to establish that such Products meet the reference standard requirements. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such Products are compatible with the Work with which they are incorporated.

1.5 When a Product is specified by prescriptive or performance Specification, any Product meeting or exceeding the Specification will be accepted.

1.6 When a Product is specified by reference to a standard or by prescriptive or performance Specification, upon request of the Consultant, obtain from the manufacturer, an independent testing laboratory report showing that the Product meets or exceeds the specified requirements.

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

2 SUGGESTED ALTERNATIVES/SUBSTITUTIONS

2.1 The base bid shall use specified products only. All suggested alternatives and supporting data must be submitted with the bid in accordance with Document 0. Requests for substitutions or alternatives will not be accepted after closing.

2.2 Contractor shall compensate the Consultant for their time and materials to evaluate substitutions after award. Compensation to the Consultant shall be $150 per hour for substitution review.

2.3 Substitutions will be considered by the Consultant provided that:

.1 The specified product becomes discontinued or is no longer available with documentation proof from the manufacturer(s).

.2 The proposed substitutions have been investigated and complete data are submitted which clearly includes highlighting all aspects that meet the specifications. Consultant will only review data submitted. Incomplete data will be grounds for non-acceptance.

.3 Data relating to changes in the Contract Schedule, if any, and relation to other Work have been submitted.

.4 Same warranty is given for the substitution as for the original Product specified.

.5 All claims are waived for additional costs related to the substitution which may subsequently arise.

.6 Installation of the accepted substitution is co-ordinated into the Work and that full responsibility is assumed when substitutions affect other work. Make any necessary changes required to complete the Work. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

2.4 Substitutions to methods or processes described in the Specifications or drawings, may be proposed for the consideration of the Consultant. Ensure that such substitutions are in accordance with the following requirements:

.1 Time spent by the Consultant in evaluating the substitution shall not be the basis for a claim by the Contractor for extensions to the Contract Time.

.2 Clearly indicate how the proposed substitutions would be advantageous to the Owner or in the opinion of the Contractor would improve the operation of the installation.

.3 Be responsible for substitutions to methods or processes concerning such Work and ensure that the warranty covering all parts of the Work will not be affected.

.4 The cost of all changes in the work of Other Contractors, necessitated by the substituted methods or processes, if accepted, is borne by the Contractor.

.5 The substituted methods or processes fit into space allotted for the specified methods or processes. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

2.5 Substitutions will not be considered for the following reasons:

.1 Due to lack of planning and failure to order products in a timely manner to ensure the Project schedule is not compromised. Such instances are not justification for product substitution.

.2 They are indicated or implied on shop drawings or Product data without formal request.

.3 Acceptance will require substantial revision of the Specifications and Drawings.

2.6 Do not substitute Products or methods or processes into the Work unless such substitutions have been specifically approved for the Work by the Consultant.

2.7 Approved substituted Products shall be subject to the Consultant's inspection and testing procedures. Approved substituted Products shall only be installed after receipt of the Consultant's written approval.

2.8 The Contract Price will be adjusted accordingly to any and all credits arising from the substitutions mentioned above.

3 APPROVAL OF PRODUCTS AND INSTALLATION METHODS

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

4 PRODUCT DELIVERY CONTROL

4.1 It is the responsibility of the Contractor to ensure that the supplier or distributor of materials specified or alternatives accepted, which he intends to use, has materials on the site when required. The Contractor shall obtain confirmed delivery dates from the supplier.

4.2 The Contractor shall contact the Consultant immediately upon receipt of information indicating that any material or item, will not be available on time, in accordance with the original schedule, and similarly it shall be the responsibility of all subcontractors and suppliers to so inform the Contractor.

4.3 The Consultant reserves the right to receive from the Contractor at any time, upon request, copies of actual purchase or work orders of any material or products to be supplied for the work.

4.4 If materials and products have not been placed on order, the Consultant may instruct such items to be placed on order, if direct communication in writing from the manufacturer or prime suppliers is not available indicating that delivery of said material will be made in sufficient time for the orderly completion of the Work.

4.5 The Consultant's review of purchase orders or other related documentation shall in no way release the Contractor, or his subcontractors and suppliers from their responsibility for ensuring the timely ordering of all materials and items required, including the necessary expediting, to complete the work as scheduled in accordance with the Contract Documents.

4.6 In the event of failure to notify the Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves the right to direct the Contractor to take the following measures at no increase in Contract Price:

.1 Substitute more readily available Products of similar or better quality and character, or

.2 Temporarily install another Product until such time as the specified Product becomes available, at which time the temporarily installed product shall be removed and the specified Product installed.

5 TRADEMARKS AND LABELS

5.1 Permanent labels, trademarks and nameplates on Products are not acceptable in the finished Work, except where required by authorities having jurisdiction, for operating instructions, or when located in service rooms.

5.2 Remove trademarks and labels by grinding, if necessary, painting out where the particular surface is being painted, or if on plated parts, replace with new plain plated or non-ferrous metal parts.

6 DELIVERY, STORAGE, HANDLING AND PROTECTION

6.1 Be responsible for handling and delivery of Products. Protect Products from damage during handling, storage and installation. Deliver store and handle items in accordance with manufacturer's instructions and as specified. Be responsible for all costs of delivery, loading and off-loading, and for transportation back to its origin for correction, if required, due to damage or defect. Reject materials and Products delivered to the Site which are damaged.

6.2 Manufacture, pack, ship, deliver, and handle Products so that no damage occurs to structural qualities and finish appearance, nor in any other way which is detrimental to their function and appearance.

6.3 Ensure that Products, while transported, are not exposed to an environment which would increase their moisture content beyond the maximum specified.

6.4 Organize delivery of materials, Products and equipment to, and removal of debris and equipment from, the site and surrounding property.

6.5 Schedule early delivery of Products to enable Work to be executed without delay. Before delivery, arrange for receiving at the Place of the Work.

6.6 Coordinate mechanical and electrical equipment and apparatus deliveries with the manufacturer's and suppliers such that equipment and apparatus is delivered to the site when it is required, or so that it can be stored within the building and protected from the elements.

6.7 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

6.8 Deliver packaged Products, in original unopened wrapping or containers, with manufacturer's seals and labels intact.

6.9 Label packaged products to describe contents, quantity, and other information as specified.

6.10 Labels attesting that materials conform to specified reference standards will be acceptable as verification that contents meet specified requirements. In the absence of labels, submit affidavits to validate conformance of Product to reference standards, as requested by the Consultant.

6.11 Label fire-rated Products to indicate Underwriters' Laboratories approval.

6.12 Handle and store materials and products in such a manner that no damage is caused to the materials and products, the Work, the site and surrounding property.

6.13 Do not obstruct or disrupt local traffic flow during construction period.

6.14 Allocate an area within the limits of the Work acceptable to the Owner for storage of Products brought to the site by all trades. Keep storage area tidy at all times and do not use other parts of the property for storage. Arrange and pay for off-site storage when required.

6.15 Locate products on site in a manner to cause minimal interference with the Work.

6.16 Store Products off the ground, in a manner to prevent damage, adulteration, deterioration and soiling to the Products, other building components, assemblies, other products, the structure, the site and surrounding property, and in accordance with manufacturer's instructions when applicable.

6.17 Store packaged or bundled Products in original and undamaged condition complete with written application instructions. Keep manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the Work.

6.18 Do not place or store materials and Products in corridors, public areas, streets, lanes, passageways or similar locations.

6.19 Store Products so as not to create any overloading conditions to any part of the building, structure, falsework, form work and scaffolding.

6.20 Store Products subject to damage from weather in weatherproof enclosures.

6.21 Store cementitious Products clear of earth or concrete floors, and away from walls.

6.22 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

6.23 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

6.24 Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous material in bulk within the Work.

6.25 Store and mix paints in a heated and ventilated room or area assigned for this purpose. Keep this room or area locked when unattended. Remove oily rags and other combustible debris from the Place of the Work daily. Take every precaution necessary to prevent spontaneous combustion.

6.26 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup specified in Section 01 74 00. Protection shall be easily removable under work of Section 01 74 00 without damage to finishes. Do not permit strippable tape or coatings to become baked on surfaces which they protect.

6.27 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use primer and paint to match original and to maintain manufacturer’s warranty.

6.28 Protect glass and other finishes against heat, slag and weld splatter by provision of adequate shielding. Do not apply Visible markings to surfaces exposed to view in finished state or that receive transparent finishes.

6.29 Protect surfaces of completed work exposed to view from staining, disfigurement and all other damage by restriction of access or by use of physical means suitable of the material and surface location.

6.30 Adequately protect trowelled concrete floors from damage. Take special measure when moving heavy loads or equipment on them.

6.31 Keep finished concrete floors free from oils, grease or other material likely to damage or discolour them or affect bond of applied finishes.

6.32 Protect finished flooring from pedestrian traffic with reinforced kraft paper as a minimum, secured in place and with joints sealed by reinforced pressure sensitive tape. Maintain protection in place until contract completion.

6.33 Protect finished flooring from continuing construction work and delivery of products with plywood panels of minimum 6 mm thickness with joints between panels sealed with reinforced pressure sensitive tape. Maintain protection in place until work and deliveries are complete.

6.34 Make good or replace damaged materials to the satisfaction of the Consultant.

6.35 Hazardous Materials Information:

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

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

7 MANUFACTURER'S INSTRUCTIONS

7.1 Unless otherwise indicated in the Specifications, fabricate, apply, connect, install, erect, use, clean, and condition Products in accordance with manufacturer's instructions except where more stringent requirements are specified. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

7.2 Notify the Consultant in writing, of conflicts between the Specifications and manufacturer's instructions, so that the Consultant may establish the course of action. If requested, make a copy of those instructions available at the site.

7.3 In cases of improper installation or erection of Products, due to failure in complying with these requirements, the Consultant may direct removal and re-installation at no increase in Contract Price.

8 WORKMANSHIP

8.1 Workmanship shall be the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required Work is such as to make it impractical to produce required results.

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

8.3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Consultant, whose decision is final.

8.4 Give particular attention to finished dimensions and elevations of the Work. Make finished Work fit indicated spaces accurately. Make finished Work flush, plumb, true to lines and levels and accurate in all respects.

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

8.6 Ensure that service poles, fill-pipes, vents, regulators, meters and similar service installations are located in inconspicuous locations. If not indicated on drawings, verify location of service installations with Consultant prior to commencing installation.

8.7 Ensure that integrity of fire separations is maintained where they are penetrated.

8.8 Finish access panels and doors to match adjacent wall and/or ceiling finish unless otherwise specified or indicated. Access panels in washrooms or wet areas shall be stainless steel.

8.9 Keep surfaces, on which finished materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.

8.10 Enforce fire prevention methods at site. Do not permit fires, open flame heating devices or accumulation or debris. Use flammable materials only if all safety precautions are taken. Provide and maintain in working order ULC labelled fire extinguishers of types suitable for fire hazard in each case, and locate them in prominent location and to approval of jurisdictional authorities.

8.11 Where flammable materials are being applied, ensure that adequate ventilation is provided, spark-proof equipment is used, and smoking and open flames are prohibited.

9 **DIMENSIONS**

9.1 In conjunction with interference drawing coordination and preparation work, check all dimensions at the site before fabrication and installation commences and report discrepancies to the Consultant.

9.2 Where dimensions are not available before fabrication commences, ensure that dimensions required are agreed upon between the parties concerned.

9.3 Prior to commencing work, ensure that clearances required by jurisdictional authorities can be maintained

9.4 Wall thicknesses and openings shown on the drawings may be nominal only; ascertain actual sizes at the site.

9.5 Verify dimensions of shop fabricated portions of the Work at the site before shop drawings and fabrications are commenced. The Owner will not accept claims for extra expense by reason of non-compliance with this requirement.

9.6 Fabricate and erect manufactured items, shop fabricated items, and items fabricated on or off site, to suit site dimensions and site conditions.

9.7 In areas where equipment is to be installed, check dimensional data on equipment to ensure that area and equipment dimensions are compatible with necessary access and clearance provided. Ensure that equipment supplied is dimensionally suitable for space provided.

9.8 The mechanical and electrical drawings are intended to show approximate locations of mechanical apparatus, fixtures, equipment, piping and duct runs, electrical apparatus, fixtures, outlets, equipment, units, and conduit in diagrammatic form and wherein the mechanical and electrical items are not dimensioned, consider their locations to be approximate. Refer to architectural drawings for location of ceiling mounted devices. Check the drawings and confer with the Consultant to determine the actual locations of these items as may be required to suit aesthetic and site conditions. Such relocation shall be done without change to the Contract Price.

9.9 Leave areas clear where space is indicated to be reserved for future equipment, including access to such future equipment.

9.10 Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils and tubes.

10 RELOCATION OF MECHANICAL AND ELECTRICAL ITEMS

10.1 The Owner and the Consultant reserve the right to relocate outlets at a later date, but prior to installation, without additional cost to Owner, assuming that the relocation per outlet does not exceed 3000 mm from the original location. No credits will be anticipated where relocation per outlet of up to and including 3000 mm reduces materials, products and labour.

10.2 Should relocations per outlet exceed 3000 mm from the original location the Contract Price will be adjusted in accordance with the provisions for changes in the Contract Documents.

10.3 Alter the location of pipes and other equipment, without additional cost to the Owner, if approved, provided the change is made before installation.

10.4 Make necessary changes, due to lack of coordination, as required and when approved, at no additional cost, to accommodate structural and building conditions.

11 EXPANSION, CONTRACTION, AND DEFLECTION

11.1 Conform to manufacturer’s recommended installation temperatures. If items, components, assemblies, systems, and finishes are installed at temperatures different from operation or service temperatures, make provisions for expansion and contraction in service as acceptable to manufacturer and consultant. Repair all resulting damage should expansion and contraction provisions provide inadequate.

11.2 Make provisions for expansion and contraction due to temperature changes within components, Products and assemblies, and between adjacent components, Products and assemblies, and due to building movements including but not limited to creep, column shortening, deflection, sway and twist. Ensure provisions for expansion, contraction and building movements prevent damages from occurring to and within components, Products and assemblies.

11.3 Make adequate allowance at wall and partition heads for deflection of the structure above. Determine requirements from Consultant where additional information is required. Where partitions butt to underside of floor assembly, or structural framing, the clearance shall be based on the span of the members supporting the floor or structural framing. In making such allowance use methods which maintain the integrity of the wall or partition as a sound, and/or fire barrier.

11.4 Make provisions in pipes, plenums, ducts and vessels containing air and fluids as is necessary to prevent damage due to fluid and air induced pressure, surges and vibrations, to pipes, plenums, ducts and vessels and to adjacent components, assemblies and construction to which pipes, ducts, plenums and vessels are attached or pass through.

12 DIELECTRIC SEPARATION

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

13 PRODUCTS AT SOUND ATTENUATING PARTITIONS

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

14 FASTENINGS

14.1 Include in the work of each section necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation of devices is in work or other sections, deliver and locate devices in ample time for installation.

14.2 Do not install fibre, plastic or wood plugs or blocking for fastenings in masonry, concrete, or metal construction, unless specified or indicated on drawings.

14.3 Install work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, construction, components and equipment under static conditions, and to resist building thermal movement, creep and vibration.

14.4 Provide metal fastenings and accessories in same material, texture, colour, sheen and finish as metal on which they occur, unless indicated otherwise.

14.5 Prevent electrolytic action between dissimilar fastening metals and materials.

14.6 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior Work, and where attached to, or contained within, exterior walls and slabs, unless stainless steel or other material is specified. Leave steel anchors bare where cast in concrete.

14.7 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

14.8 Conceal fasteners where indicated. Keep exposed fastenings to a minimum, space evenly and in an organized symmetrical pattern.

14.9 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

15 **ADJUSTING**

15.1 Ensure that all components of assemblies fit snugly, accurately and in true planes, and that moving parts operate positively and freely, without binding and scraping.

15.2 Verify that work functions properly and adjust it accordingly to ensure satisfactory operation. Lubricate Products as recommended by manufacturer.

END OF SECTION

1 DEMONSTRATION AND INSPECTION OF PRODUCTS AND SYSTEMS

1.1 Arrange for a demonstration of systems and operating Products upon the 100% completion of their installation and prior to certification for Substantial Performance.

1.2 Include in the arrangements for the attendance of the Consultant, Owner, jurisdictional authorities, and personnel assigned by the Owner for the operation of the systems and/or Products.

1.3 The Contractor and all Subcontractors shall conduct an inspection of the work, identify deficiencies and defects, and make corrections as required to conform with the Contract Documents.

1.4 Demonstrations shall be conducted by the Subcontractor responsible for the installation of the systems and/or Product, assisted by representatives of the manufacturer or supplier. All personnel conducting the demonstration shall be completely knowledgeable of all conditions of the operating, functioning and maintenance of the systems and/or Products.

1.5 Notify Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made. Request a Consultant's Inspection.

1.6 Owner's representative will acknowledge the successful completion of each demonstration on a form provided by the Contractor. The form shall be agreed to by the Owner, Consultant and Contractor prior to demonstration and testing.

1.7 Submit copies of letters from manufacturers of Systems and/or Products before making application for certificate of Substantial Performance to verify that the Products has been installed and connected correctly, and that it is operating in a satisfactory manner. The certification shall be based upon inspection and testing of the Products by competent technical personnel. Include in letter of certification the names of personnel conducting the testing and inspection, the methods of inspection utilized, and the location in the building of the Products certified.

1.8 Following submission of letters of certification and their acceptance by the Owner, the Owner shall have the right to use the Products on a trial basis and for instructing their personnel in its use.

2 FINAL INSPECTIONS AND CLOSE OUT

2.1 Submit proposed closeout procedures and schedule of inspection to Consultant for approval before final demonstrations and inspections commence.

2.2 Arrange for, conduct and document final demonstrations, inspections, close-out and take-over at completion of the Work in accordance with procedures described in OAA/OGCA TAKE-OVER PROCEDURES, OAA/OGCA Document No. 100. Where "Architect" is referred to in Document No. 100 it shall mean Consultant.

2.3 When the Contractor has carried out the steps in Stage 2 of OAA/OGCA Document 100, and has determined that the requirements of the Contract have been substantially performed as defined by local Lien legislation, the Contractor shall make application for Substantial Performance of the Work.

2.4 In addition to the requirements of OAA/OGCA Document 100, the following items shall accompany the Contractor's application for Substantial Performance. These items must be complete in all respects, and all verification certificates and reports having been submitted and approved by the Consultants:

.1 Completed Maintenance Manuals for all disciplines (No. of copies as specified in Section 01 78 23),

.2 As-Built Drawings for all disciplines (CAD drawings),

.3 Occupancy Permit (where required by Municipality),

.4 Air Balance Report (legible technicians worksheets are acceptable),

.5 Plumbing Inspection,

.6 Domestic Water Quality Test Report,

.7 Sprinkler dry and wet test verification letters stamped and signed by sprinkler design Engineer,

.8 Mechanical start-up reports (Boilers, HVAC Units, Chillers, Water Softeners, etc.),

.9 Fire Alarm verification (include legible technicians worksheets),

.10 Emergency Lighting verification,

.11 Electrical distribution system inspection,

.12 Hydro (ESA) Certificate,

.13 Systems operations have been demonstrated to Owner's personnel.

.14 Commissioning documentation from third part commissioning agent demonstrating compliance and that building envelope, mechanical, electrical and solar panel systems have been tested, verified and are certified for the Project.

2.5 The Consultants shall perform an inspection of the Work to assess the validity of the Contractors application, and shall identify in separate lists, unfinished work and deficiencies. Contractor shall correct work accordingly.

2.6 Should the Consultant concur with the Contractor's application for Substantial Performance, the Consultant shall notify the Contractor of approval of the application for Substantial Performance and issue a Certificate of Substantial Performance.

2.7 The Contractor shall publish a copy of the Certificate of Substantial Performance in a construction trade newspaper, and shall provide the Consultant with proof of the date of publication.

3 CERTIFICATE OF COMPLIANCE

3.1 Submit Certificates of Compliance, prior to the application for Substantial Performance, for each of the following items.

.1 An affidavit relative to the use of lead-free solder for all domestic water lines, regardless of location.

.2 Products for which Material Safety Data Sheets have been submitted and accepted.

.3 Other Work/Products identified in the Contract Documents as requiring a Certificate of Compliance.

3.2 Each Certificate of Compliance shall indicated names and addresses of the project, the Owner, the date of issue, product description including name, number, manufacturer, with a statement verifying that the Work/Product installed meets specified requirements and, if applicable, complies with the submitted and accepted Material Safety Data Sheets.

3.3 Each Certificate of compliance shall be issued on the subcontractor's letterhead, properly executed, under whose work the prospective Work/Product has been provided.

3.4 Each Certificate of Compliance shall be endorsed by the Contractor with his authorized stamp/signature. Ensure that submissions are made to allow sufficient time for review without delaying progress of scheduled completion.

END OF SECTION

1 LAYOUT AND SURVEY

1.1 Existing grades, lines, and site conditions shown on drawings were taken from survey information established by persons engaged directly by the Owner. The accuracy of survey information is not the Consultant's responsibility. The Contractor will establish location of property lines.

1.2 Be responsible for setting out the Work. Prior to setting out the Work, verify dimensions and elevations shown on the Contract Documents and report to the Consultant any unsatisfactory conditions that may adversely affect the proper completion of the Work.

1.3 Set up and maintain permanent reference points and be responsible for the accuracy of such reference points. Establish lines and levels required for the performance of the Work.

1.4 Accurately set out the Work from levels and lines. Where Work of this Contract is dependent upon grades and elevations of existing structures or facilities, such grades or elevations shall take precedence over those determined by reference to established elevations. Advise the Consultant of any discrepancies.

1.5 During any activity of the Work, employ a Land surveyor licensed to practice in the place of Work to layout and check all features, including but not limited to the following:

.1 Lay out building on the Site.

.2 Establish a permanent bench mark, or markers as widely separated as possible

.3 Establish and maintain temporary bench marks set in suitable locations.

.4 Provide general dimensions, lines and elevations required by Subcontractors.

.5 Verify elevations of floor and roof levels as construction proceeds and relate to bench mark datum.

.6 Verify that present or known future restrictions are not violated by construction on the site or lines of traverse to all public utilities.

.7 Correlate geodetic elevation of bench mark datum with elevations in use by public utilities adjacent to Project.

.8 Verify accuracy of site dimensions shown on Drawings.

.9 Provide a survey to verify location of footings immediately adjacent to property lines, before construction of footings proceeds.

.10 Provide a survey to verify location of building related to property lines when foundation walls are completed to grade level.

.11 Provide a survey prior to placement of asphalt and concrete paving to confirm that grades conform to grades indicated on drawings.

.12 Provide a certified survey upon completion of the Work. Survey shall include finished grades of all pavement and sidewalks, setbacks, all underground electrical and site service locations and inverts.

1.6 Examine, preserve and protect established bench marks. Re-establish a lost or displaced bench mark by a Land Surveyor licensed to practice in the place of Work at no cost to the Owner. Accept responsibility for setting out the Work.

1.7 In the event of a discrepancy between the Owner and the Contractor regarding horizontal and/or vertical alignment conditions, that are beyond allowable specified tolerance, the Owner may engage the services of an independent Land Surveyor. The surveyor shall investigate the disputed condition and the results of the independent investigation shall determine the bearer of costs for this service, being either the Owner or the Contractor.

1.8 If the Contractor is found to be in error, all costs incurred to correct the condition shall be assumed by the Contractor.

2 GEOTHERMAL SYSTEM CONSULTANT

2.1 Retain and pay for the services of an experienced Geothermal System Consultant who is a registered Professional Engineer licensed in the place of the Work and a member in good standing of a Professional Engineers Association in the place of the Work. Geothermal System Consultant to have a minimum of five (5) years' of experience in the installation of ground heat exchangers. The System Consultant shall have at least three (3) systems of similar type running satisfactorily and trouble free at time of tender.

2.2 The Geothermal System Consultant will:

.1 Provide a complete engineered geothermal field design including complete signed and stamped installation drawings.

.2 In general, consider the borehole location and header trench locations as shown on Contract Drawings as the basis of design, as they have been coordinated to suit the Project's existing trees and have been coordinated with the other services.

.3 Submit design documentation showing required peak heat rejection capacity, peak heat absorption capacity, yearly field heating capacity and yearly field cooling capacity will be fully met over a simulated 20-year period, using geothermal thermal conductivity data included in the tender package and provided by the design team.

.4 Design, recommend and review all proposed mechanical work Geothermal System shop, placement and securing drawings and sign and stamp all drawings prior to submittal for review as specified below.

.5 Supervise installation of all mechanical work for Geothermal System and when work is complete, certify in writing that the Geothermal System work has been installed in accordance with signed, stamped an reviewed drawings.

2.3 Geothermal System Consultant's/Geothermal System Control Product manufacturer's certification letters: Submit copies of the Geothermal System Consultant's Letters of Assurance as specified above.

END OF SECTION

1 GENERAL

1.1 Provide labour, Products, equipment, services, tools, and supervision necessary for cutting and patching work in accordance with the Contract Documents.

1.2 Obtain Consultant's approval prior to cutting, boring or sleeving load-bearing members.

2 DEFINITION(S)

2.1 The terms “make good”, “making good”, “made good”, “patch”, “repair”, or similar words or phases are used in standards and these Contract Documents to mean the following, unless context provides otherwise:

.1 Make good materials and finishes which are damaged or disturbed during the process of additions and reconstruction under the Contract.

.2 Where previously installed work is to be made good, match new work exactly with the previously installed work in material, form, construction and finish unless otherwise noted or specified.

.3 Where previously installed work is to be made good, there shall be no visible difference in appearance, or aesthetics between the previously installed work and the new work by the naked eye at a distance of 3 metres from the surface being made good. There shall be no difference in performance between previously installed materials and new materials.

3 SUBMITTALS

3.1 Submit written request in advance of cutting or alteration which affects:

.1 Structural integrity of any element of the Structure or Contract.

.2 Integrity of weather-exposed or moisture-resistant elements.

.3 Efficiency, maintenance, or safety of any operational element.

.4 Visual qualities of sight-exposed elements.

.5 Work of Owner’s or Other Contractors.

3.2 Include in request:

.1 Identification of Contract.

.2 Location and description of affected Work.

.3 Statement of necessity for cutting or alteration.

.4 Description of proposed Work and products to be used.

.5 Alternatives to cutting and patching.

.6 Effect on work of Owner's or Other Contractors.

.7 Date and time Work will be executed.

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

4 PRODUCTS

4.1 Same quality or better than Products incorporated in original installation.

5 PREPARATION

5.1 Inspect previously installed conditions, including elements subject to damage or movement during cutting and patching.

5.2 After uncovering, inspect conditions affecting performance of the Work.

5.3 Beginning of cutting or patching means acceptance of previously installed conditions.

5.4 Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of the project from damage.

5.5 Provide protection from elements for areas which may be exposed by uncovering Work; maintain excavations free of water.

6 EXECUTION

6.1 Execute Work to avoid damage to other Work.

6.2 Execute cutting, fitting and patching including excavation and fill to complete the Work.

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

6.4 Fit Work segments together, to integrate with penetrations through surfaces and with other Work.

6.5 Remove and replace defective and non-conforming Work.

6.6 Do any drilling, cutting, fitting, patching and finishing that may be required to make the various classes and kinds of other Work fit together in a professional and finished manner. Make watertight connections with adjoining structures.

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

6.8 Execute Work by methods to avoid damage to other Work and which will provide proper surfaces to receive patching and finishing.

6.9 Cut Products using proper equipment and methods. On rigid materials, use a core drill.

6.10 Where new Work connects with previously installed structures, cut, patch and make good previously installed work to match original condition.

6.11 Ensure compatibility between installed Products and security of installation.

6.12 Restore Work with new Products in accordance with requirements of the Contract Documents.

6.13 Fit Work airtight to pipes, sleeves, ducts, conduits and other penetrations through surfaces.

6.14 Properly prepare surfaces to receive patching and finishing.

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

END OF SECTION

1 GENERAL

1.1 Conduct cleaning operations to comply with local ordinances and environmental protection legislation.

1.2 Individual Subcontractors are responsible for the daily clean-up and removal of debris related to, or generated by, their own work. The overall responsibility for Project cleanliness rests with the Contractor.

2 PROGRESS CLEANING

2.1 Maintain the Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the Owner or other Contractors.

2.2 Remove from finish work, spatters, droppings, soil, labels, and debris, before they set up.

2.3 Ensure that only cleaning materials are used which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material.

2.4 Maintain building work areas "broom clean" at least on a daily basis, but shall also be done immediately before finishing work.

2.5 No waste material may be burned or buried at site. Remove as often as required to avoid accumulation, no less than, at the end of each working day.

2.6 Remove packaging materials and debris from the site immediately after product and equipment is unwrapped or uncrated.

2.7 Ensure that volatile fluid wastes are not disposed of in storm or sanitary sewers, in open drain courses, or anywhere on site.

2.8 Do not allow waste material and debris to accumulate in an unsightly or hazardous manner. Sprinkle dusty accumulations with water. Provide containers in which to collect waste material and debris. Dispose of hazardous products in accordance with requirements of jurisdictional authorities.

2.9 Ensure that cleaning operations are scheduled to avoid deposits, of dust or other foreign matter on surfaces during finishing work and until wet or tacky surfaces are cured.

2.10 Vacuum clean interior areas prior to start of finishing work. Maintain areas free of dust and other contaminants during finishing operations.

2.11 Provide instructions for final cleaning of finishing work, and for inclusion in Maintenance and Operating Manuals.

2.12 Remove construction debris from wall, floor, ceiling and roof cavities.

3 FINAL CLEANING

3.1 Immediately following Date of Substantial Performance, and prior to Owner occupancy of the building or portion of the building affected by the Work, conduct full and complete final cleaning operations.

3.2 Before final inspection, replace glass and mirrors broken, damaged, and etched during construction, or which are otherwise defective.

3.3 In addition to requirements for progress cleaning, Work shall include final cleaning by experienced professional cleaning companies, possessing equipment and personnel sufficient to perform full building cleaning operations on completion of construction.

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

3.5 Remove temporary protections and make good defects before commencement of final cleaning.

3.6 Final cleaning shall remove dust, stains, paint spots, soil, grease, fingerprints, and accumulations of construction materials, interior and exterior to the building. Work shall be done in accordance with manufacturer's instructions for each material. This work shall include:

.1 Washing of exterior paved surfaces, and of interior concrete floors.

.2 Remove dirt and other disfiguration from exterior surfaces.

.3 Clean all roofs, scuppers, and drainage systems.

.4 Cleaning and polishing of glass, mirrors, porcelain, enamel and finish metals.

.5 Vacuum cleaning of ceilings, walls and floors.

.6 Steam clean all carpets immediately prior occupancy by Owner.

.7 Cleaning and polishing of tile floors.

.8 Cleaning of resilient flooring.

.9 Buffing of resilient flooring followed by two light coats of wax, each buffed.

.10 Remove all paint spots or overspray from all affected surfaces.

.11 Clean inside of all millwork and cabinetry.

.12 Vacuum, clean and dust behind grilles, louvres and screens.

.13 Washing clean of glazed wall surfaces.

.14 Clean and polish all finished metal surfaces such as enamelled or stainless steel and aluminum.

.15 Cleaning of hardware, mechanical fixtures, plumbing fixtures, lighting fixtures, cover plates, and equipment, including polishing of their finish metal, porcelain, vitreous, and glass components.

.16 Clean all equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.

.17 Cleaning of curtain walls, windows, and entrances, both interior and exterior surfaces.

.18 Cleaning operations shall include the removal of all stains, spots, scuff marks, dirt, dust, remaining labels, adhesives or other surface imperfections.

3.7 Maintain cleaning until Owner has taken possession of building or portions thereof.

END OF SECTION

1 GENERAL

1.1 Conduct waste operations to comply with local ordinances and environmental protection legislation.

1.2 Store volatile wastes in covered metal containers and remove from premises at end of each working day.

2 WASTE MANAGEMENT

2.1 Comply with requirements of authorities having jurisdiction and the Environmental Protection Act.

2.2 Prepare and submit waste audit and waste reduction plan in accordance with Ontario Regulation 102/94 Waste Audits and Waste Reduction Workplans.

2.3 Prepare and submit source separation plan in accordance with Ontario Regulation 103/94 Industrial, Commercial and Institutional Source Separation Programs.

2.4 Construction and waste diversion: Divert a minimum of 75 percent by weight or volume of the total construction and demolition waste material generated by the Work to meet Toronto Green Standards (TGS). Construction and demolition waste declaration to be provided post-construction.

2.5 Deliver to nearest appropriate depot all materials accepted for recycling by the region or municipality having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material. Pay all costs for this work.

2.6 Waste containers shall be emptied on a regular basis to prevent contamination of site and adjacent properties by wind-blown dust or debris.

2.7 Subtrades shall provide waste containers for the disposal of all waste materials resulting from performance of their work.

2.8 Subtrades shall make their own arrangements for the disposal off site of any such material resulting from performance of their work and shall conform to waste management requirements of this Section.

2.9 Subtrades shall remove all regular waste material and debris from their work areas and deposit in the waste containers at the end of each working day. Any clean up work not performed as requested will be carried out by the Contractor with all resultant costs being charged to the Subtrade.

2.10 Fires and burning of rubbish or waste on site is strictly prohibited.

2.11 Burying of rubbish or waste materials on site is strictly prohibited.

2.12 Disposal of waste or volatile materials such as mineral spirits, oil, gasoline or paint thinner into ground, waterways, or sewer systems is prohibited.

2.13 Remove all surplus products, tools, construction machinery and equipment not required for the performance of remaining work, and thereafter remove any remaining materials, equipment, waste and debris.

2.14 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

END OF SECTION

1 GENERAL

1.1 Hand over to the Consultant three (3) copies of a comprehensive operations and maintenance manual and material suitable for the Owner's maintenance employees. Manuals shall cover all Products supplied and installed under the Contract.

1.2 Submit draft of the operation and maintenance manuals for the Consultant's review at least 15 days before testing systems and equipment. Incorporate alterations and additions, as found to be necessary during testing, and prepare the final version of the manual from the corrected draft.

1.3 Submit final version of operation and maintenance manuals prior to Contract Completion.

1.4 Testing of systems and equipment will not be deemed to be complete until the requisite number of copies of the final version of the manuals has been handed over to the Consultant.

1.5 If standard literature is incorporated into the operations and maintenance manual, any irrelevant information shall be deleted, or suitably noted.

1.6 The manuals shall have sufficient detail in order that the Owner can totally maintain the equipment without outside help.

1.7 Submit all material in English.

2 FORMAT

2.1 Organize data in the form of an instructional manual.

2.2 Binders: Commercial quality, 219 x 279 mm, maximum "D" ring size, having clear cover and spline pockets.

2.3 When multiple binders are used, correlate data into related consistent groupings.

2.4 Cover: Identify each binder with type or printed title "Contract Record Documents"; list title of Contract, identify subject matter of contents.

2.5 Arrange content by systems or process flow, under Section numbers and sequence of Table of Contents.

2.6 Provide tabbed fly leaf for each separate Product and system, with typed description of Product and major component parts of equipment.

2.7 Provide tabbed fly leaf for Products and systems which are supplied by the Owner but installed as part of the Work of this Contract.

2.8 Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

2.9 Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3 **CONTENTS**

3.1 Operation and maintenance manuals shall contain the following minimum information and data:

.1 Table of contents: Provide title of Contract; names, addresses, and telephone numbers of Consultants and Contractor with name of responsible parties; schedule of Products and systems, indexed to content of the volume.

.2 For each Product or system: List names, addresses and telephone numbers of Subcontractors, suppliers and service representatives, including local source of replacement supplies and parts including telephone numbers.

.3 Warranties: Warranties are between the Contractor and Owner. Warranties shall include, as a minimum:
- .1 List of subtrades with list of sections of Work and Warranties they are responsible for.
- .2 Description of warranty coverage.
- .3 Date warranty starts (being date of Substantial Performance).
- .4 Date warranty expires.
- .5 Contact name, address and phone number (the Contractor shall also be responsible for advising the Owner of changes in contact information during the warranty period).
- .6 Equipment and components performance curves.
- .7 Hydro certificates.

.4 Reports: For each Product or system provide the following:
- .1 Manufacturer's certified reports
- .2 Factory test reports.
- .3 Field testing reports.

.5 Details of design, construction and/or fabrication features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of the installation.

.6 Technical data, Product data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items and parts lists.

.7 Schematics, interconnection lists: Manuals shall be complete with schematic and wiring diagrams, wiring interconnection lists and diagrams fully cross referenced and coordinated, printed circuit board layouts including the component identification, component parts list with electronic substitution equivalent. Provide cross referenced components lists and sequence of operations.

.8 Trouble shooting and fault location guide: Instructions to facilitate quick return of malfunctioning equipment to operation.

.9 Routine servicing and preventative maintenance schedule for Products and/or estimated hours required for routine servicing and preventative maintenance tasks.

.10 List of recommended spare parts and recommended quantity of each item to be stocked based on spare part availability and re-order time.

.11 Complete set of reviewed shop drawings.

.12 Product data: Mark each sheet to clearly identify specific Products and component parts, and data applicable to installation; delete inapplicable information.

.13 Schedules: Finishes schedules including paint draw downs.

.14 Drawings: Supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams and as required in the Specifications.

.15 Typed text: As required to supplement Product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions and as required in the Specification.

.16 Record set of submittals and shop drawings shall be provided in digital format only.

4 DRAWINGS

4.1 Prepare all required drawings on REVIT.

4.2 Prepare REVIT drawings to meet the requirements of the Owners or Consultant’s REVIT Standards and Procedures.

4.3 Supply and hand over to the Consultant one CD of drawings for each final drawing prepared under this Contract, including but not limited to circuit drawings, equipment layout drawings, and shop drawings.

4.4 The final size of drawings shall be 594 mm x 841 mm. Half size reproductions shall also be provided.

4.5 Prior to Contract Completion, supply and hand over to the Consultant, one complete set of REVIT Drawing Files in REVIT format on storage media acceptable to Consultant for each final drawing prepared under this Contract.

4.6 Record set of shop drawings shall be provided in digital format only.

4.7 Text files shall be written in word processing program acceptable to Owner.

5 TRANSMITTAL

5.1 Forward storage media to the Owner through the Consultant with a transmittal form. Transmittal shall contain the list of file names contained on the storage media.

5.2 Data forwarded to the Owner shall contain the following files in addition to the design information:

.1 Library parts used in the design files.

.2 Level convention used for each design file.

.3 Plotting instructions used to prepare hard copies including colour tables, pen tables and plot scale.

.4 Working units of the design files.

.5 Font library, if the standard is not used.

END OF SECTION

1 PROGRESS RECORDS

1.1 Maintain on site, permanent written records of daily progress of the Work. Records shall be open to review by Consultant and Owner at all times and a copy shall be furnished to Consultant on a weekly basis.

1.2 Records shall show dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to number of employees of various trades and type and quantity of equipment employed daily, temperature, protection methods and other such data shall be noted.

1.3 Provide certified survey along with specified progress records and as-built drawings.

2 AS-BUILT DRAWINGS

2.1 Authorized deviations from drawings shall be marked in red accurately on one set of hard copy drawing prints in a neat, legibly printed manner and shall be dated. Prior to final inspection, submit one printed hard copy set and one digital REVIT set to the Consultant.

2.2 Maintain as-built drawings up to date as Work progresses. Status of maintained as-built drawings may be considered as a condition for validation of applications for payment.

2.3 Identify each as-built drawing as "As-Built Copy" and maintain the as-built drawings in good condition. Make as-built drawings available to the Consultant at all times.

2.4 As-built drawings shall include accurate dimensioned record of deviations and changes in Work from drawings.

2.5 As-built drawings shall be signed and dated by Contractor.

2.6 Submit as-built drawing to Consultant for review and make corrections as directed by Consultant.

2.7 Record accurately all deviations in the Work.

2.8 Accurately record locations of concealed structure, mechanical and electrical services and similar Work not clearly in view, the location of which is required for maintenance, alteration Work and future additions. Do not conceal such Work until the location has been recorded.

2.9 Accurately record locations of equipment bases, anchors, concrete pads and roof curbs, sleeves, piping, conduits, ducts, maintenance holes and valves, etc. located either below, outside or within structure.

2.10 Where piping, conduits and ducts are underground, underfloor, embedded in concrete or otherwise in inaccessible locations, accurately record with respect to structure column lines or walls and elevations with respect to finished floor levels or grades referenced to the centre line of components.

2.11 Accurately record any components which will be in inaccessible locations for Consultant's review before the component is covered, or buried, or made inaccessible.

2.12 REVIT drawings of Contract Drawings can be obtained from Consultant at costs indicated in the Electronic Transfer Agreement appended to Section 01 33 00.

2.13 Clearly and prominently mark each drawing “AS-BUILT DRAWING prepared by _____ _____ (name of Contractor)”

END OF SECTION

1 Part 1 - General

1.1. **General Instructions**

.1 Comply with Division 1 Requirements and documents referred to herein.

.1 This section of the specification shall be read in conjunction with all relevant section of Specification Volume 2 and 3 as well as electrical and mechanical commissioning specifications.

1.2. **Definitions**

.1 Commissioning process (Cx Process): A quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirement.

.2 Commissioning plan (Cx Plan): A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process.

.3 Commissioning Team (Cx Team): The individuals who through coordinated actions are responsible for implementing the Commissioning Process.

.4 Commissioning Authority: Commissioning authority in charge of the commissioning process and recommends final acceptance.

.5 Validate: for tests and demonstrations: to witness and validate successful performance demonstration or record deficiencies; to validate after correction successful demonstration; these validations of the tests become references for the Consultant's certification.

.6 Certify: for documents including as-built drawings: Review for accuracy and completeness or record deficiencies.

.7 Witness: The Commissioning Authority will observe as required and record summary of test results.

.8 BAS: Building Automation System for controls.

.9 TAB: Testing, Adjusting and Balancing for system verification.

.10 Pre-Functional Checks: These are based on checklists developed by the Contractor and Subs/Manufacturers and supplemented by Commissioning Authority as required. The checklists will be completed by the contractor with spot checks by the Commissioning Authority. These checklists are intended to review the quality of the installation including equipment condition, accessibility, serviceability, adherence to installation requirements, completeness, and operation preparedness.

.11 Functional Verification: The Functional Verification or Performance Testing procedures and forms are developed by the Commissioning Authority. On-site testing is performed by the contractor under the direction of the Commissioning Authority. Functional Verification is dynamic testing to evaluate the various systems through all expected as well as emergency modes of operation. Functional Verification verifies

operation of the equipment, controls and controls sequences, as well as interconnected systems.

.12 Integrated System Testing: The Integrated System Testing is an integrated test procedure to verify the interoperability of building life safety, fire protection, HVAC controls, telecommunication, emergency power, normal power, security hardware controls and related user systems under normal, failure, fire alarm and return to normal operation. This testing requires the coordination of the entire commissioning team along with the local fire department and owner's building monitoring agencies.

1.3. **References**

.1 CSA Z320-11 - Building Commissioning

.2 ASHRAE Guideline 0-2005 - The Commissioning Process

.3 ASHRAE Guidelines 1-19 - Guidelines for Commissioning of Specific Systems

1.4. **Documents**

.1 In case of discrepancies or conflicts between documents, documents will be governed in the order specified in Division 1.

1.5. **Commissioning Objectives**

.1 Objectives of commissioning process are:

.1 to support quality management through monitoring and checking of installation;

.2 to verify system performance through testing and commissioning of completed installation;

.3 to move completed facility from "static completion" state to optimal "dynamic" operating state;

.4 to transfer facility from Contractor to Owner in such a manner that provision of a quality facility to Owner has been assured.

.5 to optimize operating and maintenance through delivery of comprehensive quality training and instruction to Owner's operating personnel.

.6 to assure provision of accurate and useful historical records, such as, as-built drawings, test certificates, etc. to Owner. Such records provide important data for operating and maintaining systems as well as for future system testing, maintenance or renovations and to trouble shoot and repair the components of systems.

.7 to extend commissioning into operational phase in order to verify performance levels under a range of operating conditions; such as change of seasons. This process will help to avoid unforeseen or hidden operating and maintenance expenses that may develop later on.

.8 to monitor operation, performance and maintenance programs; optimize system's performance under normal operating conditions, reasonable possible

operating conditions (equipment failure, partial system failure, etc.), partial occupancy, and full occupancy, under the direction and review of Commissioning Authority. This phase lasts throughout warranty period and involves activities to ensure completion of:

- system debugging and optimization.
- completion of training and instruction for operating and maintenance personnel.
- completion of all commissioning activities on defective, seasonally-sensitive systems, for varying modes and periodic simulated emergency conditions.

.9 commissioning shall be considered complete when all of the objectives of commissioning, as specified herein, have been achieved.

1.6. **Commissioning Meetings, Scheduling and Reporting**

.1 Contractor shall include the commissioning activities in their construction schedule and shall schedule for all tests and equipment start-up in the construction schedule.

.2 Commissioning meetings shall be scheduled as required. The meetings shall address commissioning related responsibilities as well as all specified testing, documentation, O&M manuals, training, and post construction requirements. The testing schedules and results of all tests shall be reviewed at the meetings.

.3 Where construction may be completed in phases, allow for the frequency of meetings to correspond to the varying stages of construction of each phase.

.4 The Contractor shall attend commissioning meetings at regular intervals, as called by the Commissioning Authority.

.6 The Contractor shall schedule work to include specified Commissioning related tasks. Cooperate with the Owner's Commissioning Authority, and coordinate sub trades as required, to successfully demonstrate and verify commissioning related testing and verifications.

.7 The Contractor shall schedule work to include specified Commissioning related testing prior to Owner's demonstration and Owner's training.

.8 Testing forms and reports associated with the commissioned systems shall be directed to the Owner, to the Consultant, and to the Commissioning Authority.

.9 The forms and reports to be issued shall include:

.1 shop drawings, issued and accepted;

.2 verification checklists;

.3 testing forms;

.4 reports resulting from tests;

.5 testing schedule;

.6 TAB Report;

.7 Equipment start-up reports;

.8 Pressure test reports

1.7. Commissioning Plan

.1 Commissioning Authority will prepare and issue a Commissioning Plan document at the beginning of the construction phase in this project. The document will be prepared in accordance with the building commissioning standard guidelines (e.g. CSA standard). The contents will include the roles and responsibilities of various stakeholders in this project, commissioning scope, list of systems to be commissioned, documentation requirement, training, etc. in compliance with the project document and related standards for performing commissioning work.

1.8. Responsibilities of Contractor

.1 Construction Phase:

.1 to manage and ensure entire installation comply with requirements of the Contract Documents;

.2 submit shop drawings complete with Contractor's Stamp of Review;

.3 submit working detail (interference or installation) drawings, as required;

.4 complete commissioning installation verification checklists;

.5 submit a commissioning schedule. This schedule shall include:

.1 time schedule for system and equipment commissioning which are in compliance with the timing and sequences of installation. In this schedule allow for additional time for testing and commissioning, such that re-test of the equipment can be performed in a timely manner if required without impacting the overall project schedule or cause delay to Project completion;

.2 dates for completion of required factory tests prior to equipment delivery to the site shall be indicated in the schedule.

.3 dates for completion of required manufacturer start-up testing shall be indicated in the schedule.

.4 Commissioning schedule is to be fully integrated into the project schedule, clearly indicating which activities must occur prior to commissioning activities taking place.

.6 prepare and submit testing and commissioning record or report forms for review and approval;

.7 attend progress and commissioning meetings;

.8 promptly rectify or replace reported deficiencies and defects;

.9 where required by codes and/or specification, retain manufacturers and/or independent third parties to provide service for testing and certification of the systems and training of Owner's personnel;

.10 provide training and instruction to the Owner's operating personnel;

.11 perform testing and start-up of equipment and systems to the satisfaction of the Consultant and Commissioning Authority. Provide completed start-up forms to the Consultant and Commissioning Authority;

.12 perform functional testing of equipment and systems to the satisfaction of the Consultant and Commissioning Authority. Functional testing will be directed by the Commissioning Authority as required. Functional performance testing forms will be completed by the Commissioning Authority;

.13 pay for and be responsible for all inspections required by codes, specification and Authorities having Jurisdiction. Obtain and submit all Certificate of Approval for such inspections and verifications;

.14 submit for review as-built drawings including those for location of control devices and wiring and operating and maintenance manuals for each equipment as per the specification requirements;

.15 provide Operating and Maintenance Manuals for review by the Consultant and Commissioning Authority with all the testing and commissioning results and reports incorporated;

.16 obtain, issue and assign warranties for equipment and systems to the Owner;

.17 provision of all necessary test equipment shall be the responsibility of the contractor. Provide recently validated calibration certificate for all equipment to be used for verification prior to testing and commissioning commencement.

.2 Post-Construction Phase:

.1 optimize operation according to occupant's needs, using the System Description Manual prepared by the Commissioning Authority as reference points;

.2 complete all commissioning procedures and activities and performance verification procedures which were delayed or not concluded during the commissioning phase;

.3 revise all “as-built” and operating and maintenance documents to reflect all changes, modifications, revisions and adjustment upon completion of commissioning;

.4 participate in the end-of-warranty commissioning review meeting coordinated by the Commissioning Authority. promptly rectify or

1.9. **Commissioning Involvement**

.1 Commissioning Authority shall direct, witness and validate as required; and Contractor and/or his Suppliers shall perform the following:

.1 check and ensure installation of systems and equipment to ensure installations are completed and in a proper and safe state ready for testing and commissioning;

.2 Start-up: run the systems and equipment to verify their operation, direction, and installation prior to testing and verification;

.3 Functional Testing: run and test the systems and equipment through their design parameters to verify their capabilities in performance, sequencing, safety protection and alarms annunciation;

.4 Integrated Systems Testing: test and validate the interaction between commissioned systems. Tests are to include a fire alarm integrated system test and a blackout test.

.5 ensure deficiencies and defects found are rectified and replaced and the systems and equipment re-tested as required;

.6 arrange and provide demonstration and training of Owners’ personnel;

.7 issue Operating and Maintenance Manuals for systems and equipment;

1.10. **Demonstration and Training**

.1 Instructions

.1 Thoroughly instruct Owner’s authorized representative(s) in safe operation of systems and equipment after installation of Work. Coordinate with Consultant and arrange commissioning program and schedule for instruction times. Submit a training schedule to Consultant, minimum 8 weeks prior to start of training.

.2 Arrange and pay for services of qualified service engineers and manufacturers' representatives to instruct Owner’s authorized representatives on specialized portions of installation, such as refrigeration machines, boilers, automatic controls and water treatment.

.3 Submit a complete record of instructions as part of maintenance instructions and data book given to Consultant. For each instructional period, supply following data:

.1 date.

.2 system or equipment involved.

.3 names of persons giving instructions.

.4 names of persons being instructed.

.5 other persons present.

.4 Carry out instructional period during a continuous period agreed with Consultant.

.5 Permit usage of systems prior to Substantial Performance for purpose of testing and learning operational procedures. This usage shall not affect warranties and no claim for damage shall be made against Consultant for any injury or breakage to any part or parts of above due to aforementioned tests, where such injuries or breakage are caused by a weakness or inadequacy of parts, or by defective materials or quality of performance of any kind.

.6 At end of training, obtain and submit to Consultant, signature of Owner's authorized representative(s) stating they understand system and equipment installation, operation and maintenance requirements.

.7 Obtain and submit to Consultant, letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested equipment and systems installed and have approved methods of installation, connections and operation.

.8 Only exception to foregoing requirements for acceptance of equipment and systems, will be 'fine tuning' which may be performed prior to Completion of Contract.

.9 In conjunction with foregoing requirements, Contractor shall arrange necessary inspections and obtain written approval and acceptance of equipment and systems requiring approval by authorities having jurisdiction, and subsequent correction of those unacceptable items to satisfaction of such authorities.

.2 WARRANTY

.1 Involvement of Commissioning Authority does not void any guarantees or warranties nor does it relieve Contractor of any contractual responsibilities.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Read and conform to:

.1 Division 1 requirements and documents referred to therein

.2 Leadership in Energy and Environmental Design LEED V4: Monitoring Based Commissioning – Green Building Rating System Reference Guide;

.3 Toronto Green Standards (TGS) v3.0

.4 Ontario Building Code (OBC)

.5 Zero Emissions Buildings Framework; City of Toronto

.6 Making the Case for Building to Zero Carbon, Canada Green Building Council

.7 International Performance Measurement and Verification Protocol (IPMVP)

.8 National Plumbing Code of Canada 2015

.9 Ontario Electrical Safety Code

.10 Technical Standards and Safety Authority (T.S.S.A.) Safety Act and associated documents

1.2 **STANDARDS**

.1 Canadian Standards Association CAN/CSA-B149.1 or ANSI B109.3: Natural Gas and Propane Installation Code, as amended by local Gas Code.

.2 Canadian Electrical Manufacturer's Association, CSA

.3 Electrical Safety Authority (ESA)

.4 Measurement Canada

.5 Consumer and Corporate Affairs Canada (CCAC) and certification for legal sub-metering.

.6 ANSI C12.20: 1997 Accuracy Standard meeting or exceeding MID accuracy standard.

.7 Canadian Standards Association C22.2 No.205-[M1983(R1999)], Signal Equipment

.8 Listed by the Underwriters Laboratory Inc., Standard (UNUCNL file E124377), 1 and FCC Part 15, Subpart. J. FCC Class A is required for commercial installations. The system shall be approved by Industry and Science Canada of Measurement Canada AE0763, AE0763 Rev 1, AE019AE-97-0028, AE0818

.9 Institute of Electrical and Electronics Engineers IEEE C37.90.1- [02], Surge Withstand Capabilities (SWC) Tests for Relays and

.10 Relay Systems Associated with Electric Power Apparatus

.11 American Water Works Association (AWWA)

.12 National Science Foundation i.e., NSF International NSF/ANSI 61 certified, Annex F and Annex G compliant

.13 CE, UL listed, CSA GP, MID 004 (custody transfer) according EN1434 (water/other liquids) and OIML R75

.14 Temperature sensors and Energy Calculators to meet EN1434 / CSA C900.1 accuracy: Heat Meter Standard.

.15 National Institute of Standards and Technology (N.I.S.T)

.16 ASHRAE 13-2015: Specifying building automation systems:

1.3 **DEFINITIONS**

.1 Provide a permanent complete building Energy Metering system and coordination work that satisfies the requirements of LEED V4: Monitoring Based Commissioning credit and TGS V3.0, GHG 4.4: sub-metering credit.

.2 Provide an electronic digital metering system (DMS) also known as Central Energy Management System and database for reading and archiving all electrical meters, thermal energy/BTU meter data. The DMS database system shall connect to:

.1 all electrical metering points as shown on electrical drawings.

.2 all thermal energy/BTU metering points as shown on mechanical drawings

.3 Provide a DDC System i.e., the Building Automation System (BAS) and associated database for reading and archiving all VFD kWh, and pump & fan Runtime readings for non VFD Motors as listed below.

.1 all VFD kWh readings for all VFDs as shown on mechanical drawings and controls schematic drawings

.2 all runtime and calculated kWh readings for all non-VFD motors as shown on mechanical drawings and controls schematic drawings.

.4 The Digital Metering System (DMS) to include communications interface compatible with the BAS. Provide DMS with OPC Client or OPC Server or equivalent interface device as an option to integrate all meter data from the DMS with other applications such as building automation systems (BAS), if required by Owner.

.5 Coordinate supply and installation of necessary power supply required for all metering points according to the meter manufacturer’s recommendation

.6 Coordinate supply and installation of all data communication between all the meters and the Digital Metering System (DMS) and the BAS and between the DMS and the Building Automation System (BAS) via suitable interface.

.7 Provide training for DMS and BAS data extraction to the Owner and M&V consultant.

.8 Provide M&V consultant and the owner the shop/bench test calibration certificates of all electrical meters, Thermal Energy/BTU meters (including the associated energy calculators, flow sensor and the temperature sensors) from the respective meter manufacturer (Exempt main incoming Electrical meter and the water meter supplied and installed by local Electricity, and Potable Water Utility provider respectively). In addition to the above, provide relevant meter sizing calculation of Thermal Energy meters from the relevant meter manufacturer while purchasing individual meters.

.9 Coordinate submitting signed on-site calibration and/or point-to-point commissioning certificate/report by electrical Contractor, electronic digital metering system (DMS) contractor and controls/mechanical (i.e., BAS) contractor confirming correct installation, wiring of all meters, verification of measurement accuracy of all electric meter, thermal energy/BTU meters, water meters and HVAC monitoring points.

.10 Coordinate with the building owner to ensure that the DMS and the BAS are accessible remotely via the Internet and preferably by web-based interface.

1.4 REFERENCES

.1 Abbreviations and Acronyms.

.1 BAS: Building Automation System

.2 DDC: Direct Digital Control

.3 DMS: Digital Metering System

.4 HVAC: Heating Ventilation and Air-Conditioning

.5 LEED: Leadership in Energy and Environmental Design; www.cagbc.org

.6 TGS: Toronto Green Standard

.7 VFD: Variable Frequency Drive

END OF SECTION

1 GENERAL

1.1 **DEFINITIONS**

.1 Building Envelope: The overall assembly that provides separation between conditioned spaces and the outdoor environment, or any indoor environment substantially different from another indoor environment or the outdoor environment.

.2 Validate: To witness performance testing of the building envelope or record deficiencies; after deficiencies are repaired, to witness a successful demonstration of performance. These tests become references for the Architect's certification.

.3 Witness: The Cx Authority will observe as required and record summary of test results.

.4 Cx Authority: Consultant in charge of the commissioning process and recommendation of final acceptance.

.5 Independent Third Party Inspection and Testing Agent: Independent agent specialized in the review and testing of building enclosure systems and equipment and is retained by the Contractor or Owner.

1.2 **REFERENCES**

.1 CSA-Z320-11 - Building Commissioning

.2 ASHRAE Guideline 0-2013 - The Commissioning Process

.3 NIBS Guideline 3 – 2012 - Exterior Enclosure Technical Requirements for the Commissioning Process

.4 LEED - Green Building Rating System Reference Guide

1.3 **COMMISSIONING OBJECTIVES**

.1 Objectives of commissioning process are:

.1 To support quality management through monitoring and checking of installation;

.2 To validate system performance through testing and commissioning of completed installation;

.3 To move completed facility from "static completion" state to optimal "dynamic" operating state;

.4 To transfer facility from Contractor to Owner in such a manner that provision of a quality facility to Owner has been assured.

.5 To optimize operating and maintenance through delivery of quality driven, comprehensive training and instruction to Owner's operating personnel.

.6 To provide accurate and useful historical records, such as as-built drawings, test certificates, etc. to Owner. Such records provide important data for operating and maintaining systems as well as future system testing, maintenance or renovations, trouble shooting and repairing the components of systems.

.7 To extend commissioning into the operational phase to verify performance levels under a range of operating conditions such as change of seasons. This process will help to mitigate unforeseen or hidden operating and maintenance expenses that may develop.

.2 The commissioning requirements of the general contractor and sub-contractor or trade responsible for the final detailing and construction of the building envelope are included in Part 1 of each of the technical specification Sections included in this Project Manual as they relate to the design and construction of the building envelope for this project (Divisions 2 through 9.

.3 Commissioning shall be considered complete when:

.1 All of the objectives of commissioning, as specified herein, have been achieved; and

.2 Full and complete compliance with the building envelope performance requirements set forth by the Architect-of-Record in the Basis-of-design (BOD) for this project is achieved.

1.4 **COMMISSIONING MEETINGS, SCHEDULING, and REPORTING**

.1 The Contractor shall include the commissioning plan in their construction schedule and shall schedule for all tests in the construction schedule.

.2 Commissioning meetings shall be scheduled as required. The meetings shall address commissioning related responsibilities as well as all specified testing, documentation, Operation and maintenance manuals, training, and post construction requirements. The testing schedules and results of all tests shall be reviewed at the meetings.

.3 The Contractor shall attend commissioning meetings, as called by the Cx Authority.

.4 The Contractor shall schedule work to include specified Commissioning related tasks. Cooperate with the Owner's Cx Authority, and coordinate subtrades as required, to successfully demonstrate and verify commissioning related tests.

.5 The Contractor shall schedule work to include specified Commissioning related testing prior to Owner's demonstration and Owner's training.

.6 Test forms, reports and submittals associated with the building envelope systems shall be directed to the Architect and Cx Authority.

.7 The Cx Authority will visit the site monthly and provide written monthly summaries (Reports) of the work in progress during the construction of the building envelope. These reports will include, but may not be limited to, photographs, sketches, and diagrams as required illustrating conditions observed in the field, especially deficiencies noted, together with proposed solutions for those conditions where appropriate for further review and acceptance by the Architect-of-Record for the project. Any changes to the contract documents arising out of the Building Envelope Commissioning Program must be submitted, reviewed, and accepted in writing, by the Architect-of-Record and Owner and submitted with a series of details/schematics and material specifications to the Contractor for pricing prior to implementation on the project. The Contractor shall be responsible for coordinating and managing the commissioning responsibilities of each of the subcontractors responsible for the building envelope.

.8 The Inspection and Testing Agency is required to complete at minimum two site visits per week during the construction of the building envelope. Their reports will include, but may not be limited to, photographs, sketches, and diagrams as required illustrating conditions observed in the field, especially deficiencies noted. The Contractor shall be responsible for coordinating the Inspection and Testing Agency building enclosure site visits.

1.5 WARRANTY

.1 Involvement of Cx Authority does not void any guarantees or warranties nor does it relieve Contractor of any contractual responsibilities.

1.6 RESPONSIBILITIES OF CX AUTHORITY

.1 Responsibilities of Cx Authority are as follows:

.1 Construction Phase:

.1 Review Contractor’s reviewed as noted/reviewed shop drawing submission for commissioning related issues.

.2 Prepare commissioning plan based on the contractor’s schedule and installation methodology;

.3 Observe the installation during the construction stage.

.4 Review building envelope related inspection and testing reports for commissioning related issues, including reports from Inspection and Testing Agency.

.5 Supervise the commissioning, including scheduling.

.6 Prepare issue logs noting concerns that may have an impact on the commissioning of the systems.

.7 Attend construction site meetings as required to discuss commissioning related items and any impact on Project schedule.

.8 Set-up and chair commissioning meetings.

.9 Witness and validate mock-up reviews and system tests; note items of concern and issue progress reports.

.10 Work with the project team to resolve commissioning related problems that may arise due to site conditions.

.11 Co-ordinate Contractor provided instruction and training with Owner.

.12 Prepare Systems operation manual.

.2 Post-Construction Phase:

.1 Prepare final report on commissioning, identifying any deficiencies that may be outstanding.

.2 Recommend additional training and/or instruction of operation and maintenance personnel deemed necessary over and above that already provided.

.3 Complete system checks with Contractor:

.1 Once during the first month of building operation.

.2 Once in the sixth month of building operation (in a season opposite to turn-over – Summer or Winter).

.4 Conduct whole building air leakage testing using thermography and fog in order to identify areas of air leakage.

.3 The Cx Authority is not authorized to:

.1 Release, revoke, alter or expand requirements of Contract Documents.

.2 Approve or accept any portion of the work.

.3 Perform any duties of the Contractor.

1.7 RESPONSIBILITIES OF OWNER

.1 Responsibilities of Owner are as follows:

.1 To provide clear indication of the project requirements including intent.

.2 To provide operation personnel to attend training and instruction regarding specific components and systems.

.3 To retain the services of independent third parties (Inspection and Testing Agency) for system verification and certification as required in the project documentation or by applicable codes.

.4 To observe on-site installation, and testing of envelope systems.

1.8 RESPONSIBILITIES OF ARCHITECT

.1 Responsibilities of Architect are as follows:

.1 Review contractor’s shop drawings and submittals to ensure that the components and systems proposed are compliant with specification requirements;

.2 Review contractor’s installation program to ensure that the installation sequences have been coordinated with the project schedule;

.3 Monitor, check and inspect the installation throughout the construction stages to ensure the components and systems are installed correctly, and

the installation method, workmanship and procedures follow the approved submission and method statement;

.4 Inspect the systems installation and issue deficiency reports. Ensure deficiencies are corrected and certify installation of systems;

.5 Review contractor's commissioning plan to ensure the proposed tests, sequences and method of tests conform to the contract requirements and the testing and commissioning sequences coincide with the project schedule;

.6 Review operation and maintenance manuals, test reports and as-builts for accuracy;

.7 Witness tests; note any deficiencies and provide progress report;

.8 Certify completion of contractor's commissioning.

1.9 RESPONSIBILITIES OF INSPECTION AND TESTING AGENCY

.1 Responsibilities of Inspection and Testing Agency are as follows:

.1 Familiarize themselves with project documents, including shop drawings accepted by Architect;

.2 Inspect the installation of the building envelope a minimum of twice per week during the construction of the building envelope, and provide reports for each of these inspections;

.3 Provide all necessary test equipment. Provide recently validated calibration certificates for all equipment to be used for verification prior to testing and commissioning commencement.

.4 Complete all specified testing of the building envelope, except for whole building air leakage testing (which shall be completed by the Cx Authority), and provide written reports documenting all testing.

.5 Attend any building envelope commissioning meetings.

1.10 RESPONSIBILITIES OF CONTRACTOR

.1 Responsibilities of Contractor are as follows:

.1 Construction Phase:

.1 To review, understand, and meet the Owner's Project Requirements.

.2 To manage and ensure installation complies with the requirements of the Contract Documents;

.3 Submit shop drawings complete with Contractor's Stamp of Review;

.4 Prepare and submit the project specific Quality Assurance Program intended to be implemented on the project for Architect and Cx Authority review.

.5 Submit working detail (interference or installation) drawings, as required;

.6 Complete and participate in the construction of on-site mock-ups, as identified in Divisions 2 through 9.

.7 Complete commissioning mock-up checklists and test forms;

.8 Submit an installation and commissioning schedule. This schedule shall include:

.1 Time schedule of each activity, with lead and lag time allowed and indicated;

.2 Shop drawings and working detail drawings submission;

.3 Laboratory testing and project specific testing as outlined in the construction documents.

.4 Coordinated installation activities and sequences in compliance with the Contractor's project schedule and sub-trade installation schedule;

.5 Time schedule for system and specialty component commissioning. The schedule should allow for additional time for testing and commissioning, such that re-test of the systems can be performed in a timely manner, if required, without impacting the overall project schedule or causing delay to Project completion;

.9 Prepare and submit testing and commissioning record or report forms for review and approval;

.10 Attend progress and commissioning meetings;

.11 Promptly rectify or replace reported deficiencies and defects and facilitate review and sign-off of corrected conditions by Inspection and Testing Agency prior to concealment;

.12 Where required by codes and/or specification, retain manufacturers and/or independent third parties to provide service for testing and certification of the systems and training of Owner's personnel;

.13 Provide training and instruction to the Owner's operating personnel;

.14 Assist with testing and commissioning of specialty components and systems to the satisfaction of the Architect and Cx Authority as stated in approved schedule described above. Testing will be completed by the Inspection and Testing Agency and will be witnessed by the Cx Authority as required. The Contractor or his agents shall also record procedures and findings for approved tests, which shall be submitted to the Architect and Cx Authority with the signature of the tester, for review and approval;

.15 Assist Cx Authority with whole building air leakage testing, including assisting with preparing intentional openings and being present during entire test to review and immediately repair areas showing air leakage during the test. This is to ensure that any qualitative air leakage identified with fog testing is repaired and tested right away to confirm repair effectiveness;

.16 Pay for and be responsible for all inspections required by codes, specification and Authorities having Jurisdiction. Obtain and submit all Certificate of Approval for such inspections and verifications;

.17 Provide Operating and Maintenance Manuals for review by the Architect and Cx Authority with all the testing and commissioning results and reports incorporated;

.18 Obtain, issue and assign warranties for specialty component and systems to the Owner;

.2 Post-Construction Phase:

.1 Complete all commissioning procedures and activities and performance verification procedures which were delayed or not concluded during the commissioning phase;

.2 Complete system checks:

.1 Once during the first month of building operation;

.2 Once in the sixth month of building operation (in a season opposite to turn-over – Summer or Winter);

.3 Complete correction of all deficiencies revealed by these checks.

.3 Schedule a question and answer session for the operating and maintenance personnel 3 months after handover of the facility to the Owner. The duration of this session or sessions will be dictated by the number of questions or concerns that shall be addressed.

.4 Certify that building envelope systems, subsystems, and construction have been completed according to the Contract Documents, including all addenda and change order requirements

.5 Certify that Field Quality Control procedures have been completed, and that field quality control reports have been submitted, discrepancies corrected, and corrective work approved. Provide a copy of the list of non-conformances maintained by the General Contractor indicating all rework and corrections completed.

1.11 SYSTEMS TO BE COMMISSIONED

.1 Building envelope systems shall include but not limited to following:

.1 Below or At Grade Assemblies;

.2 Vertical and Non-Vertical Wall Assemblies, including water, vapour, air and thermal control layers;

.3 Fenestration (windows and curtainwall assemblies);

.4 Roofing Assemblies;

.5 Soffit Assemblies

.6 Planters and paving systems and assemblies over occupied spaces;

.7 Specialty Equipment and Components;

1.12 **TESTING EQUIPMENT**

.1 Contractor to provide access, ladders and lift equipment to facilitate testing as required by the Inspection and Testing Agency and by the Cx Authority.

1.13 **DOCUMENTATION**

.1 Contractor shall record test results and procedures on approved record forms and submit the forms together with copies of test certificates to the Architect and Cx Authority for review and approval.

.2 When results are validated, Cx Authority shall incorporate those records in the System Operating Manual as reference for future system/equipment performance tests.

1.14 **SUBMITTALS**

.1 The Contractor is to provide the following submittals to the Cx Authority, including the Inspection and Testing Agency, in addition to submitting them to the Architect-of-Record:

.1 Coordination Drawings: Provide cross references on all shop drawings indicating that drawings have been checked and cross-referenced by the Contractor to ensure that adjacent elements (i.e. wall elements and fenestration elements) and the dimensions and construction tolerances indicated will allow work at interfaces to be constructible.

.2 Qualifications data: For fabricators, installers, and testing agencies, submit to the Cx Authority for review all qualifications required in Divisions 2 through 9 for review.

.3 Preconstruction Test Reports: All preconstruction air and water leakage performance 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.

.4 Source Quality Control Reports: Retain a copy for field review by the Cx Authority and include in the closeout submittal a copy of all manufacturer QC/QA reports submitted for products supplied for the project.

.5 Field Quality Control Reports: Provide a copy of the test reports for all field water and air penetration and other appropriate building envelope tests completed

.6 Special Inspections Reports for all special inspections indicated by the Architect/Engineer-of-Record in the specifications.

1.15 **TESTING FOR BUILDING ENVELOPE SYSTEMS**

.1 See requirements for preconstruction testing of mock-ups in the individual building envelope specification sections.The Contractor is to complete and participate in the construction of on-site mock-ups to check constructability, material transition and adjacencies for elements of the building envelope, as identified in the individual sections of the envelope specifications..

.2 The Contractor, representatives from each relevant subcontractor, and trades associated with the mock-up compilation shall be present during the construction of the mock-up and during review by the Architect, Third Party Inspection & Testing Agency. The Cx Authority may also be present at the mock-up. Personnel from each trade that will be completing the work in the field are to be utilized to construct each required mock-up.

1.16 **tOPERATION AND MAINTENANCE MANUAL**

.1 Contractor shall prepare and submit the Operation and Maintenance Manual as detailed in the specification to Architect six (6) weeks prior to beginning of training. An Operation and Maintenance Manual Systems Manual is to be developed for each major building envelope system, including but not limited to:

.1 Roof
.2 Exterior walls
.3 Glazing Systems
.4 Doors
.5 Sealants and expansion joints
.6 Control joints
.7 Flashings
.8 Shading devices
.9 Planters and planted areas
.10 Below grade construction
.11 Floors, slab on grade
.12 Other special building

.2 Contractor shall re-submit the manual should the Architect find deficiencies. Training shall not begin until the manual has been accepted by the Architect.

.3 One copy of the manual shall be forwarded to Cx Authority in hard copy [searchable electronic (PDF)] format.

.4 The Operation and Maintenance manual shall be organized by specification section and shall include, but is not limited to, closeout requirements listed in the specifications and more specifically:

.1 Project Directory. The project directory shall contain the names, addresses, fax numbers and telephone numbers of Contractors, Subcontractors, manufacturers and manufacturer’s representatives.
.2 Operating procedures.
.3 Maintenance procedures.
.4 Spare material parts list.
.5 Troubleshooting guide.
.6 Testing and verification forms.
.7 Certification forms.

.8 As-built drawings, including a copy of all details and drawings that were installed as part of any addendums or change order directives. All deviations shall be clearly marked in red pen.

.9 Specifications for the project, including all accepted product substitutions and any additional specifications as part of any addendums or change order directives. All accepted product substitutions and all deviations shall be clearly marked in red pen.

.10 A copy of all accepted change orders.

.11 A copy of all final shop drawings for each product requiring shop drawings, with the A/E mark-ups and comments, showing final as-built conditions

.12 A copy of all warranties, organized by product, and any and all product manufacturer letters indicating the product as appropriate to use for the application intended on the project as well as any installation guidance

.13 A master product list summarizing all products used in the project for construction of the building envelope, organized by tabs in a binder, including the following information:

.1 Product name

.2 Manufacturer

.3 Catalog or other applicable information for ordering

.4 Manufacturer's contact information, including the contact information for the technical representatives, including one national contact and one regional technical representative contact

.5 Product color

.6 Supplier contact information

.7 Products installation instructions, including installation instructions supplied with any of the shop drawings that indicated field installed items

.8 Manufacturer's product maintenance guide

.9 Manufacturer's checklist for periodic review of the product indicating how often the product should be checked and the process for implementing a repair

.5 Operating procedures shall be the recommended manufacturer's operating procedures for identified components and specialty equipment.

.6 Maintenance procedures shall include scope of work, frequency of activity, material or parts required and necessary documentation.

.7 Spare material [parts] list shall be manufacturer's recommended list for maintenance purposes.

.8 Troubleshooting guide shall be manufacturer's recommendation for components and specialty equipment.

.9 Component and specialty equipment included in the manual shall include make, model, serial number, electrical characteristics.

.10 Finalized Operation and Maintenance Manual shall be submitted to the Owner in accordance with the requirements of the Construction Documents.

1.17 **SYSTEMS OPERATING MANUAL**

.1 Systems Operating Manual will be used by the maintenance personnel to assist them in the daily operation of the systems.

.2 Systems Operating Manual shall be prepared by Cx Authority using data collected by Contractor and test results.

.3 Each section describing a system will contain as a minimum:

.1 a basic description of the system, component or specialty equipment;
.2 system location and area it serves;
.3 a basic description of function;
.4 services and locations;

.4 Cx Authority shall provide a copy of the Systems Operating Manual to Owner.

1.18 **OPERATOR TRAINING AND INSTRUCTIONS**

.1 Contractor and equipment manufacturers shall provide operator training for each system, component and piece of specialty equipment.

.2 The training and instruction shall be provided by qualified technicians and shall be conducted in a classroom setting.

.3 Training and instruction will begin when the Operation and Maintenance Manual has been approved and delivered to Owner.

.4 Each session shall be structured to cover:

.1 the Operation and Maintenance Manual;
.2 system description, operating and maintenance procedures;
.3 trouble-shooting procedures;
.4 warranty
.5 manufacturer’s or service representative’s name, address and phone number.

.5 Contractor shall prepare a detailed training and instruction plan. This plan shall include the outline of all sessions and identification of the training presenters.

.6 Submit the plan including a copy of training manual for Cx Authority’s review and approval.

.7 Provide course documentation for up to 6 people.

.8 The sessions shall be co-ordinated by the Contractor.

.9 Training and instruction shall be provided for the following systems wherever applicable:

SYSTEM	MINIMUM TRAINING DURATION
Architectural Design Summary	1 hours
Roofing	0.5hour per type
Cladding Systems	0.5 hour per type
Entrance Systems	0.5 hour per type
Glazing Systems	0.5 hour per type
"Other" Systems (Overhead Door, Operators, Other)	0.5 hour per type

.10 Training and instruction requirement for the building envelope system shall include a walk-through of building by Contractor. During the walk-through the Contractor shall:

.1 identify system and specialty equipment;
.2 identify maintenance requirements;
.3 identify functional aspects;
.4 identify access requirements;

.11 When each session has been completed, training attendance lists are to be provided to the Cx Authority for review and sign-off related to completion.

1.19 **SYSTEMS DEMONSTRATION AND TURNOVER**

.1 System demonstration and turnover to the Owner shall occur when:

.1 the installation is complete;
.2 acceptance tests have been successfully completed;
.3 Cx Authority system verification has been successfully completed;
.4 training and instruction has been completed;
.5 Operating and Maintenance Manual has been accepted;
.6 shop drawings have been updated;
.7 as-built drawings have been completed.

.2 Systems demonstration shall be conducted by Contractor and manufacturers. The demonstration shall cover all operation and maintenance requirements and a physical demonstration of equipment installation and operation.

1.20 **TESTING FORMS**

.1 Contractor and manufacturers shall provide information required to complete forms and any other additional data sheets not included in this specification, but

required for the building envelope systems of this Project. All forms to be supplied by Cx Authority.

.2 Commissioning data form shall be maintained by Cx Authority to track progress of the commissioning requirements.

1.21 **SYSTEM AND SPECIALTY EQUIPMENT WARRANTIES**

.1 System and specialty equipment warranties shall be as defined in Division 01.

.2 Contractor shall re-visit the building during the warranty period with Architect, Cx Authority and Owner. During these visits the performance of the system shall be reviewed. These visits shall occur:

.1 once during the first month of building operation;

.2 once during the sixth month of building operation (in a season opposite to turn-over – Summer or Winter);

.3 The Owner shall organize these visits.

.4 At these meetings Owner, Architects and Cx Authority shall review the performance of the systems. If the performance is satisfactory then no further action need to be taken. If unsatisfactory then Contractor will be instructed to correct deficiencies, at his cost, to the satisfaction of Architect.

END OF SECTION

1 GEOTECHNICAL INFORMATION

1.1 Refer to detailed geotechnical information appended to Volume 3 - Reports.

1.2 This geotechnical information records properties of subsurface conditions and recommendations for the design of foundations, pavements and soil remediation as outlined in the information provided.

1.3 The geotechnical information by its nature, cannot reveal all conditions that exist or can occur on the Site. Perform inspection of excavation as outlined in the geotechnical report to verify soil conditions on site and report to the Consultant results of inspections. Should subsurface conditions be found to vary substantially from the report, immediately notify Consultant in writing and await instructions.

1.4 Contractor shall not be entitled to extra payment or extension of Contract Time for work which is required and which is reasonably inferable in the geotechnical information as being necessary.

1.5 In case of discrepancies between recommendations contained in geotechnical information and requirements of Contract Documents, the latter shall govern. Advise Consultant in writing of any discrepancies discovered.

END OF DOCUMENT

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for demolition and removal work in accordance with the Contract Documents.

.2 Work included: Requirements for demolishing and removing wholly various items designated on the drawings or required to be removed for Work of this Contract, including not necessarily limited to:
- .1 Clearing and grubbing of site as indicated and required.
- .2 Removal of concrete basement foundation walls and footings, including concrete slabs, rubbish, debris and items not scheduled to remain on site, resulting from the demolition and preparatory work.
- .3 Remove abandoned services such as pipes, fixtures, equipment, etc. where required for the work or indicated on the drawings.
- .4 Removal of concrete curbs and sidewalks, and other site amenities as indicated on drawings.
- .5 Dust control during the operations of the work of this Section.
- .6 Removal shall mean removal from site and safe disposal in a legal manner.

1.2 **WASTE MANAGEMENT**

.1 Demolition waste target shall meet Toronto Green Standards (TGS) as specified in Section 01 74 19.

1.3 **REFERENCES**

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

.2 OPSS, Ontario Provincial Standard Specification.

1.4 **SUBMITTALS**

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

.2 Sequence/plan:
- .1 Submit sequence/plan in accordance with Section 01 33 00.
- .2 30 calendar days prior to start of demolition and removal work, submit for plan showing sequence of removal work in accordance with authorities having jurisdiction.
- .3 Submit engineered sequence/plan to remove existing foundations along west property line in conjunction with installation of shoring.
- .4 Have submissions signed and sealed by Professional Engineer licensed in Province of Ontario.

.3 Submit to Consultant, details of where rubble, debris and other materials are to be disposed or reused. Include each disposal/reuse site location, operator's name and business address, type of license under which site operates, and criteria used by site to assess suitability of rubble, debris and other materials for disposal.

.4 Give notice to Utility Authorities controlling services and appurtenances which will be affected by demolition work.

1.5 **QUALITY ASSURANCE**

.1 Prepare waste audits, waste reduction workplans, source separation programs and recycling programs as required by Section 01 74 19, jurisdictional authorities and update programs and implement such programs as required.

.2 Perform the work of this section in accordance with the 'Environmental Protection Act' including Ontario Regulation 102 and the 'Environmental Assessment Act' including Ontario Regulation 103.

.3 Conform to Fire Code, Regulation under the Fire Marshals Act.

.4 The demolition contractor must engage a registered professional engineer who holds a certificate of authorization and an appropriate level of liability insurance to prepare demolition procedures.

.5 As part of the contract requirements, the engineer for the demolition contractor should be required to sign the general review commitment required by city building departments.

2 Products

2.1 **MATERIALS**

.1 All materials requiring removal shall become the Contractor's property and shall be removed and disposed of from the site, as the work progresses, unless indicated otherwise.

.2 Recycled granular fill:
- .1 Clean native soil may be re-used on site if approved by soil engineer.
- .2 Crushed gravel obtained during recycling demolition procedures may be used on site if approved by soil engineer.
- .3 Where approved by soil engineer, salvaged materials shall only be used for purpose of filling provided they are free of organic matter and meet requirements of OPSS 1010.

3 Execution

3.1 **GENERAL**

.1 Clean up rubble and debris, resulting from work promptly and dispose at end of day or place in waste disposal bins. Empty bins on regular basis.

.2 Stockpiling of rubble, debris, and surplus Products on Site will not be permitted.

.3 Take precautions to guard against movement, settlement or collapse of adjacent services, sidewalks, driveways, or trees. Be liable for such movement, settlement or collapse caused by failure to take necessary precautions. Repair promptly such damage when ordered.

.4 It was recently discovered that a house existed on the east half of the property that was demolished in the 1980s. Considerable demolition waste may result from said house that is not readily apparent.

3.2 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Examine adjacent structures and other installations prior to commencement of demolition and removals work in accordance with Section 31 00 00.

3.3 **PRESERVATION OF REFERENCES**

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

3.4 **PROTECTION**

.1 Provide flagmen where necessary or appropriate to provide effective and safe access to Site to vehicular traffic and protection to pedestrian traffic.

.2 Prevent movement or damage of adjacent structures, services, walks, paving, trees, landscaping and adjacent grades. Supply and install bracing as required. Make good damage caused by demolition to acceptance of Consultant.

.3 Protect adjacent structures and property against damage which might occur from falling debris or other causes. Repair or replace damage caused from work of this Section to acceptance of Consultant.

.4 Do not interfere with use of adjacent structures and Work areas. Maintain free, safe passage to and from adjacent structures and Work areas.

.5 Take precautions to support affected structures. If safety of structure being demolished, adjacent structures or services are endangered, cease demolition operations and take necessary action to support endangered item. Immediately inform Consultant. Do not resume demolition until reasons for endangering have been determined and corrected and action taken to prevent further endangering.

.6 If movement or settlement occurs, install additional bracing as necessary and make good damage to acceptance of Consultant.

.7 Pay particular attention to prevention of fire and elimination of fire hazards which would endanger Work or adjacent structures and premises.

.8 Close off access to areas where demolition is proceeding by barricades and post warning signs.

.9 Supply, install and maintain legal and necessary barricades, guards, railings, lights, warning signs, security personnel and other safety measures, and fully protect persons and property.

.10 Dust protection:
- .1 Clean water to be applied to hard and soft surfaces and on open excavation faces on Site daily to eliminate dust.
- .2 Roadways and sidewalks to be cleaned daily or as required.
- .3 A designated truck loading area on granular material or existing asphalt to be used to mitigate tracking of potentially contaminated soil and demolition debris off Site. Contaminated loading points to be cleaned or re-established.
- .4 Loaded vehicles leaving Site to be cleaned of loose soil and debris with power washing or alternative method.
- .5 Trucks loaded with indigenous soil or demolition debris to be covered by tarps or attached screens.

.11 Blasting is not permitted.

3.5 PREPARATION

.1 Remove abandoned lines as indicated on Contract Drawings and as required for new construction. Post warning signs on electrical lines and equipment which is required to remain energized.

.2 Disconnect and cap designated mechanical services:
- .1 Natural gas supply lines: As indicated on drawings and as required for new construction, to be removed by qualified workers in accordance with gas company instructions.
- .2 Sewer and water lines: Remove and dispose of as indicated on Contract Drawings and as required for new construction.
- .3 Other underground services: Remove and dispose of as indicated on Contract Drawings and as required for new construction.

.3 Do not disrupt active or energized utilities designated to remain undisturbed.

.4 Perform rodent and vermin control to comply with health regulations.

3.6 **CLEARING AND GRUBBING**

.1 Clear and grub as necessary to remove tree stump and roots from area designated on Contract Drawings. Tag and adequately protect trees shown on Contract Drawings to be preserved in accordance with authorities having jurisdiction.

.2 Leave ground surface in condition suitable for stripping of topsoil.

3.7 **DEMOLITION**

.1 Perform demolition with extreme care. Confine effects of demolition to those parts which are to be demolished.

.2 Perform work and prevent inconvenience to persons outside those parts which are to be demolished.

.3 Carry out demolition in accordance with the requirements of CSA S350-M.

.4 Completely demolish concrete basement foundation walls as indicated.

.5 Demolish basement foundation walls, footings, basement slab and additional debris as required that are remaining on site and resulting from earlier mentioned house.

.6 Demolition shall proceed safely in systematic manner as necessary to accommodate demolition work indicated.

.7 Oversized bricks, concrete chunks and rock can be separated for crushing by mechanical means instead of disposal. Crushed materials can be intermixed with granular material for use as backfill.

.8 Perform work to minimize dusting. Keep work area wetted down with fog sprays to prevent dust and dirt rising. Supply and install temporary water lines and connections that may be required. Upon completion, remove installed temporary water lines. Use covered chutes, water down.

.9 Do not sell or burn materials on Site.

.10 At end of day's work, leave Work in safe condition.

.11 Drainage and sewer system protection:
- .1 Ensure that no dust, debris or slurry enters drainage and sewer system on Site.
- .2 Remove and dispose of debris and slurry promptly from Site.
- .3 Comply with City of Toronto Sewer Use By-Law.

.12 Concrete sidewalks and curbs:
- .1 Remove existing sidewalks as required to suit Project scheduling.
- .2 Break out and remove existing concrete curbs and sidewalks within confines of Work as shown on Contract Drawings.
- .3 Square up adjacent surfaces to remain in place by saw cutting or other methods acceptable to Consultant to avoid damage to remaining sidewalks and curbs.
- .4 Protect adjacent joints and load transfer devices.
- .5 Protect underlying granular materials.

.13 Fencing: Remove fencing and associated materials as indicated on Contract Drawings.

14. Demolish all other items indicated or required.

3.8 RECYCLING

.1 Whenever possible, all materials shall be recycled. Pay all costs for this work.

.2 Deliver to nearest appropriate recycling depot all materials accepted for recycling by Authorities having jurisdiction over the Place of Work..

3.9 DISPOSAL OF MATERIALS

.1 Remove from Site, rubble, debris, and other materials that can not be recycled resulting from demolition and removals work in accordance with Section 31 00 00 and Authorities having Jurisdiction, except where specified or indicated on Contract Drawings to be reused.

.2 Conform to requirements of municipality's Works Department regarding disposal of waste materials.

.3 Materials prohibited from municipality waste management facilities shall be removed from Site and dispose of at recycling companies specializing in recyclable materials.

3.10 RESTORATION

.1 Where demolition removed a structure or installation, rough grade and restore area in accordance with Section 31 00 00 and Authorities having Jurisdiction.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for topping work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM C1708, Standard Test Methods for Self-Leveling Mortars Containing Hydraulic Cements.

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
  - .1 Sections, details, materials, dimensions, thicknesses of each layer, maximum and minimum thicknesses, 3, 7, and 28 day load characteristics, and surface finishes.

.3 Certificates: Submit certification from manufacturer, stating that materials proposed for use are compatible with specified floor finishes.

1.4 **QUALITY ASSURANCE**

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator’s current certificate of approval by the material manufacturer as proof of compliance.

.2 Mock-up:
- .1 Construct one room mock-up of topping in location acceptable to Consultant.
- .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
- .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.5 **SITE CONDITIONS**

.1 Do not install work of this Section outside of manufacturer recommended environmental ranges without Consultant's and Product manufacturer's written acceptance.

.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 48 hours before, during, and 48 hours after installation.

2 Products

2.1 **MATERIALS**

.1 Concrete based levelling compound:
- .1 Compressive strength to ASTM C1708, 28 day, 3500 psi.
- .2 Flexural strength to ASTM C1708: 28 day, 800 psi.
- .3 Primer: Type as recommended by topping manufacturer to suit intended condition.
- .4 Fiber reinforced calcium aluminate cement based, self-leveling underlayment, 'TechLevel WSF - Fiber Reinforced Self-Leveling Underlayment for Wood Subfloors' by Custom Building Products or approved alternative.

.2 Water: potable.

2.2 **MIXES**

.1 Mix toppings in accordance with manufacturer's written instructions.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

.1 Examine wood subfloors and ensure they conform to the topping manufacturers requirements.

.2 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance. Obtain manufacturer's approval of substrate in writing, submit copy to Consultant.

.3 Prohibit traffic on prepared areas until work of this Section is completed.

.4 Supply and install temporary protection to adjacent surfaces, floor drains, and steel angles to prevent damage resulting from work of this Section.

.5 Fill any open joints with product as approved by topping manufacturer.

.6 Apply primer to subfloors and allow to dry.

3.3 INSTALLATION

.1 Install topping in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Levelling topping:
- .1 Install levelling material in accordance with manufacturer's instructions.
- .2 Let cure in accordance with manufacturer's, recommendations.

3.4 PROTECTION

.1 Provide temporary protection for surfaces subjected to concentrated loads before they have cured sufficiently to carry them without damage.

.2 Prevent traffic over completed areas, and protect work of this Section from precipitation, freezing, and debris after final installation.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for concrete block masonry work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A1064/A1064-M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 ASTM C207, Specification for Hydrated Lime for Masonry Purposes.

.3 CAN/CSA A23.1-M, Concrete Materials and Methods of Concrete Construction.

.4 CSA A165 Series, CSA Standards on Concrete Masonry Units.

.5 CSA A179, Mortar and Grout for Unit Masonry.

.6 CSA A370, Connectors for Masonry.

.7 CSA A371, Masonry Construction for Buildings.

.8 CAN/CSA A3001, Cementitious Materials Compendium.

.9 CAN/CSA G30.18-M, Billet-Steel Bars for Concrete Reinforcement.

.10 CSA S304, Design of Masonry Structures.

1.3 **SUBMITTALS**

.1 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating.
- .2 Wall sections and details, reinforcing and anchors, special detailing, patterning and locations of control joints.

.2 Samples:
- .1 Submit samples in accordance with Section 01 33 00:
- .2 Submit samples of each type and colour of masonry unit used prior to placing order.
- .3 Submit samples of masonry anchors, and ties.

.3 Quality control submittals: Submit manufacturer's certificates stating that materials supplied are in accordance with this Specification.

1.4 QUALITY ASSURANCE

.1 Provide plain and reinforced masonry in accordance with CSA A370, CSA A371, and CSA S304.

.2 Cold Weather Protection:
- .1 To CAN/CSA-A371 and as follows:
  - .1 Maintain temperature of mortar between 5°C and 50°C until batch is used or becomes stable.
  - .2 Maintain ambient temperature of masonry work and it's constituent materials between 5°C and 50°C and protect site from windchill.
  - .3 Maintain temperature of masonry above 0°C for minimum of 3 days, after mortar is installed.
  - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10°C, before applying mortar.
  - .5 Do not use scorched aggregate. Do not use salts or anti-freezes. Only use approved smokeless heaters.

.3 Hot Weather Requirements:
- .1 To CAN/CSA-A371 and as follows:
  - .1 Plan in advance for hot weather construction. Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
  - .2 Avoid using dry masonry in hot weather conditions. Use predampened masonry unit nominally saturated, but surface dry at time of laying. Do not dip masonry unit in bucket of water.
  - .3 Spread only enough mortar to permit soft setting of masonry units; do not over mix mortar materials; do not retemper mortar after 2 hours of use; do not retemper pigment coloured mortar; do not spread more than 900 mm (3') of mortar for placement of masonry unit.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle Products in accordance with the Conditions of the Contract and as specified herein.

.2 Remove unacceptable materials from Site and replace to acceptance of Consultant. Store materials off ground protected from wetting by rain, snow or ground water, or inter-mixture with earth or other materials. Store metal ties and reinforcement to prevent corrosion.

.3 Do not concentrate storage of materials on any part of structure beyond design load, take particular care not to overload unsupported portions of structure which may have not attained their full design strength.

.4 Comply with CAN3-A371. Do not use salt or calcium-chloride to remove ice from masonry surfaces.

.5 Deliver mortar materials in original unbroken and undamaged packages with the maker's name and brand distinctly marked thereon. Prevent damage to units.

.6 Keep masonry materials free from ice and frost. Keep units protected from concrete, mortar and other materials which could cause staining.

2 Products

2.1 **MASONRY UNITS**

.1 Concrete block units: Normalweight units, CSA A165 Series, sizes as indicated on Contract Drawing, classifications as follows:
.1 H/15/A/M.
.2 SS/15/A/M.
.3 SF/15/A/M.

.2 Special shapes: Unless indicated otherwise, supply and install corner returns, bull-nosed or double bull-nosed units for exposed and external corners, bond beams, sash blocks for control joints, solid block where noted, concrete block lintels over openings in concrete block walls and any additional special shapes as indicated.

.3 Obtain each masonry unit type from same manufacturer. Supply and install units of uniform texture and colour for each kind required.

.4 Supply masonry units with exposed surfaces free of cracks, chips, blemishes, and broken corners.

2.2 **ACCESSORIES**

.1 Wire reinforcement: CAN3-A370, CAN3 A371, and ASTM A1064/A1064-M, hot dip galvanized. This specification is based on products manufactured by Blok-Lok Limited. Products by Dur-O-Wal Ltd. and Fero Corporation are approved alternatives:
.1 Single wythe: Truss type; ‘Blok-Trus BL30'.

.2 Connectors: CSA A370 and CSA S304.

.3 Reinforcing steel: CSA G30.18-M, Grade 400, refer to Contract Drawings for number, size, and location.

.4 Compressible filler: 75 x 6 mm thick preformed, polyurethane foam; 25V by Emseal Joint Systems Ltd.

.5 Control joint filler: Prefabricated extruded rubber joint to suit wall thickness; RS Series Rubber Control Joint by Blok-Lok or approved alternative.

2.3 **MORTAR MATERIALS**

.1 Loadbearing masonry: CSA A179, Type S, proportion method.

.2 Interior non-loadbearing masonry: CSA A179, Type N, proportion method.

.3 Cement: CAN/CSA A3001, normal Portland, Type GU.

.4 Hydrated lime: ASTM C207, Type S.

.5 Masonry aggregate: CSA A179.

.6 Water: Clean potable, free from deleterious elements and free from salts that can cause efflorescence.

.7 Concrete fill and grout: Minimum 12.5 Mpa concrete in accordance with CSA A179.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PROTECTION**

.1 Supply and install temporary waterproof, non-staining coverings, secured against displacement, to extend over walls and down sides to protect masonry work from snow and wind driven rain, and from drying too quickly, until masonry work is completed and protected by flashings or other permanent construction.

.2 Supply and install non-staining, protective coverings on horizontal and vertical surfaces to protect work of this Section from damage, staining, marking, and mortar droppings.

3.3 **WORKMANSHIP**

.1 Perform masonry work in accordance with CAN3 A371 and as indicated .

.2 Supply and install masonry work plumb, level and true to line, with vertical joints in alignment and horizontal courses level, uniform, and straight.

.3 Install masonry work to a plane flatness and exposed end tolerance of 3 mm in 2400 mm.

.4 Variation in Alignment from Unit to Adjacent Unit: 1.5 mm maximum.

.5 Variation of Mortar Joint Thickness: 3 mm every metre.

3.4 **MASONRY - GENERAL INSTALLATION**

.1 Construct masonry work as required by jurisdictional authorities.

.2 Before commencing masonry work, verify required limitations for wall heights, wall thicknesses, openings, bond, anchorage, lateral support, and compressive strengths of masonry units and mortars.

.3 Construct masonry fire protection and fire separations of the thickness indicated on Drawings for the fire resistant ratings as noted on Drawings, and conforming to the Fire-Performance Ratings, Appendix 'D' to the National Building Code of Canada.

.4 Fire Separations and Fire Separations with Fire Resistance Ratings: Construct walls tightly to construction above and at perimeter, and without openings or voids. Do not reduce the thickness of walls to less than the thickness indicated on the Drawings or for the required fire resistance rating where required.

.5 Do not butter corner units, throw mortar droppings into joints, or excessively furrow bed joints. Do not shift or tap units after mortar has taken initial set. If adjustment is necessary after mortar has started to set, remove and replace with fresh mortar.

.6 Do not use admixtures without Consultant's written acceptance.

.7 Tool mortar joints slightly concave with non-staining tools unless indicated otherwise. Strike joints flush in non exposed areas or where shown on Contract Drawings. Use sufficient force to press mortar tight against masonry units on both sides of joints. Remove excess, remaining mortar material and burrs.

.8 Cut masonry units with a wet saw to obtain straight, clean, even, unchipped edges. Cut units as required to fit adjoining work neatly or for flush mounted electrical outlets, grilles, pipes, conduit, leaving 3 mm maximum clearance. Use full-size units without cutting wherever possible.

.9 Reinforce block walls with continuous wire reinforcement in every second block course. Supply and install prefabricated L and T sections. Cut, bend and lap reinforcing units as per manufacturer's printed directions for continuity at returns, offsets, pipe enclosures, and other special conditions. Bending of masonry reinforcement is not permitted.

.10 Reinforce masonry walls with reinforcing steel as indicated on Drawings. Vertical reinforcing shall be fully grouted in masonry cores with grout.

.11 At openings in block walls install extra reinforcement, so that first and second courses above and below openings are reinforced. Extend extra reinforcement 600 mm beyond opening in each direction.

.12 Reinforce joint corners and intersections with strap anchors 400 mm o.c.

.13 Do not place reinforcement across masonry wythes at control joints.

.14 Install masonry with 10 mm thick joints unless indicated otherwise. Make vertical and horizontal joints equal and of uniform thickness.

.15 Build control joints in masonry walls at intervals and in locations shown. Form joints for block walls using sash block units in accordance with details shown. Fill chase and joint with joint filler full height of control joints. Leave a depth of 13 mm for sealing unless otherwise shown.

.16 Install control joints in masonry walls where indicated on drawings and at projections and changes in direction. Where control joints have not been indicated provide joints at 9150 mm o.c. for interior walls.

.17 Supply and install solid block or metal lath under block, and fill block cells solid for lintel bearing and as required to secure built-in anchor bolts and/or anchors shown.

.18 Do not tooth intersections of walls except as otherwise indicated.

3.5 **MORTAR MIXING**

.1 Thoroughly mix mortar ingredients in proper quantities needed for immediate use to requirements of CSA A179.

.2 Measure and batch mortar materials either by volume or weight, to accurately control and maintain proportions. Do not measure materials by shovel.

.3 Mix mortar with maximum amount of water consistent with workability for maximum tensile bond strength within capacity of mortar.

.4 Do not use mortar which has begun to set. Use mortar within 2 hours after initial mixing. Re-temper mortar during 2 hour period only as required to restore workability.

.5 Add admixtures to requirements of manufacturer's instructions.

.6 Provide uniformity of mix.

3.6 **BLOCK**

.1 Lay blocks in running bond except as indicated otherwise. Align block webs vertically and install thicker ends of face shells up.

.2 Install a full bed of mortar for first courses of masonry, for masonry units 100 mm thick and less, and between solid units. For remaining courses bed face shells, including vertical end joints, fully in mortar.

.3 Install special shaped and sized concrete block units as indicated and as required for a complete and coordinated assembly and to minimize cut units.

.4 Supply and install two courses of solid block beneath lintel bearing.

.5 Stagger end joints in every course. Align joints plumb over each other in every other course.

.6 Bond intersecting block walls in alternate courses. Where block work abuts concrete, anchor each block course to concrete.

3.7 **LINTELS**

.1 Install concrete block lintels over openings in masonry.

.2 Set lintels with minimum of 200 mm uniformly distributed bearing at each end.

3.8 **BUILT-IN ITEMS**

.1 Coordinate and locate build-in items required to be built into masonry or supplied under work of other Sections including hollow metal doors, lintels, sleeves, inserts, etc. Build-in items to present a neat, rigid, true and plumb installation.

.2 Build wall openings, slots, and recesses required for ducts, grilles, pipes and other items.

.3 Coordinate installation of conduit, outlet boxes and other mechanical and electrical built-ins with work of Divisions 21, 22, 23, 24, 26 and 28.

.4 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as Work progresses.

.5 Brace door jambs to maintain plumbness. Set anchors between metal frames and masonry and fill voids between hollow metal frames and masonry walls with mortar.

3.9 **INSTALLATION TOLERANCES:**

.1 Planes true to within 3 mm under 3 m straightedge.

.2 Plumb within 6 mm in 3 m, or in 6 mm in 6 m at external corners, expansion joints, or other conspicuous lines.

.3 Level within 6 mm in any bay or 6 m maximum distance, and 12 mm in 12 m or more.

.4 Located from position shown, and from related position of columns, walls, and partitions within 12 mm in any bay or 6 m maximum distance, and 19 mm in 12 m or more.

.5 Opening sizes within 6 mm of designated dimension.

.6 Column and wall cross-section dimensions within minus 6 mm and plus 12 mm.

.7 With joints to dimensions indicated, but in no case greater than 12 mm.

3.10 REPAIR AND POINTING

.1 Remove and replace masonry units which are loose, chipped, broken, cracked, marked, stained, discoloured, or otherwise damaged. Supply and install new units to match adjoining units and install in fresh mortar, and point to eliminate evidence of replacement.

.2 During tooling of joints, enlarge any cracks, holes, or other defects, point and completely fill with mortar.

.3 Point-up joints including corners, openings and adjacent Work for a neat, uniform appearance, properly prepared for application of sealant compounds.

3.11 CLEANING

.1 Obtain and follow unit masonry manufacturer's written instructions for cleaning of masonry.

.2 Clean exposed, masonry surfaces, removing excess mortar as work progresses. Allow mortar droppings to partially dry then dry brush with a stiff fibre brush.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for the miscellaneous and metal fabrication work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.

.2 AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels - Series: Components, Coatings and Finishes.

.3 ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).

.4 ASTM A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished

.5 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

.6 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.7 ASTM A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

.8 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.9 ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

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

.11 ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.12 ASTM B211, Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

.13 CISC/CPMA 1.73a, A Quick-Drying One-Coat Paint for Use on Structural Steel.

.14 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

.15 CAN/CSA S16.1-M, Limit States Design of Steel Structures.

.16 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.17 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.18 CSA W48, Filler Metal and Allied Materials for Metal Arc Welding.

.19 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.20 CAN/CSA W117.2-M, Safety in Welding, Cutting and Allied Processes.

.21 CGSB 85-GP-16M, Painting Galvanized Steel.

.22 NAAMM, The National Association of Architectural Metal Manufacturers.

.23 Steel Structures Painting Council (SSPC), Steel Structures Painting Manual, Vol. 2.

1.3 DESIGN REQUIREMENTS

.1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16.1 and CSA S136.1.

1.4 SUBMITTALS

.1 Shop drawings:
- .1 Submit shop drawings for fabrication and erection of miscellaneous and metal items in accordance with Section 01 33 00 indicating:
  - .1 Materials, core thicknesses, class of finish (AMP 555), connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
  - .2 Ensure shop drawings are of one uniform size and based on field measurements.
  - .3 Aluminum plates: Elevations, details, profiles, dimensions, thickness of material, finish, method of joining, joint location, special joints, methods of anchoring, relationship to adjoining construction, and details of other pertinent components of the work.

.2 Samples:
- .1 Submit samples in accordance with Section 01 33 00 of the following:
  - .1 Each gate hardware item for the Consultant’s review.

.3 Certification: Submit compliance certificate from Engineer of record certifying that guards, stairs and ladders meet design criteria and performance requirements of this Section.

1.5 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in work of comparable complexity and scope, to perform the following services as part of the work of this Section:
- .1 Design steel stairs, handrails and railings, glazed guard, and metal fabrication items that are required to resist live, dead, lateral, wind, or seismic loads.
- .2 Engineer of record for design of guards, stairs and ladders is responsible for periodically inspecting the work and providing a compliance certificate upon completion of this work.
- .3 Review, stamp, date and sign shop drawings.

.2 Workmanship: Fabricate work of this Section to meet the required class of workmanship indicated below in accordance with AMP 555, Section 8.
- .1 Class 1: for use on direct exposed to view fabricated items:
  - .1 Exposed surfaces are finished smooth with pitts, mill marks, nicks, burrs, sharp edges, and scratches filled or ground off. Defects should not show when painted, polished, or finished.
  - .2 Welds should be concealed where possible. Exposed welds are ground to small radius with uniform sized cove unless otherwise noted.
  - .3 Distortions should not be visible to the eye.
  - .4 Exposed joints are fitted to a hairline finish.

.3 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1. Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work.

.4 Perform stainless steel work in accordance with NAAMM, Code of Standard Practice for the Metal Industry, Workmanship, Class 1.

.5 Mock-up:
- .1 Guard: Fabricate, deliver, and erect one full scale 1200 mm long sample section of each guard, including a typical handrail bracket, in location acceptable to Consultant.
- .2 Aluminum plates: Fabricate, deliver, and erect one 1200 mm long sample section of an aluminum plate, demonstrating inside corner and end closure, in location acceptable to Consultant.
- .3 Demonstrate finishes, colours, and quality of workmanship.
- .4 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

2 Products

2.1 **MATERIALS**

.1 General:
- .1 All materials under work of this Section, including but not limited to, primers and paints are to have low VOC content limits.
- .2 Wherever possible, metals used in work of this Section are to contain recycled content.
- .3 Unless detailed or specified herein, standard products will be acceptable if construction details and installation meet intent of Drawings and Specifications.
- .4 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.
- .5 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharp defined profiles.

.2 Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W. Hollow structural sections: CAN/CSA-G40.20/G40.21-M, Grade 350W, Class H.

.3 Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.

.4 Stainless steel materials:
- .1 Stainless steel sheet and plate:
  - .1 ASTM A480/A480M, Type 304 for interior use; Type 316 for exterior use and sink applications, finish to AISI No. 4. Size as shown.
  - .2 Provide stainless steel sheet material for locations such as but not limited to cladding material for basement kitchen countertops under finish carpentry work of Section 06 20 00.
- .2 Stainless steel shapes: ASTM A276, Type 304 for interior use; Type 316 for exterior use and sink applications, finish to AISI No. 4. Sizes and shapes as shown.

.5 Aluminum materials:
- .1 Aluminum extrusions and channels: ASTM B211 and ANSI H35.1 AA6063 alloy, T6 temper.
- .2 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 3 mm thick aluminum plate.
- .3 Aluminum finishes:
  - .1 Aluminum finish (Type 1 - ALUM):
    - .1 Finish to be ‘Duranar (XL)’ by PPG in accordance with AAMA 2605.
    - .2 Colour: Colour to be ‘Silver UC 82 989 XL’ for use at exterior aluminum plate window jambs, vestibule wall panels and any additional areas as indicated.

.2 Aluminum finish (Type 2 - ALB): Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A31. For use at wall bases.

.6 Metal siding (at access gate): In accordance with Section 07 46 19.

.7 Welding materials: CSA W48 and CSA W59-M.

.8 Fasteners:
- .1 Conforming to ASTM A307, Grade A.
- .2 Use countersunk fasteners with Robertson screw for architectural miscellaneous metals, Z275 zinc coated in accordance with ASTM A653/A653M.
- .3 In other areas exposed to view, use heavy duty bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts Z275 zinc coated in accordance with ASTM A653/A653M. Supply bolts of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

.9 Primer paint: CPMA 1.73a.

.10 Galvanized primer paint: Inorganic zinc rich primer. For use on galvanized fabrications where touch up is to remain unpainted in finished work; Carbozinc 11WB by Carboline Company, Catha-Coat 305 by Devoe Coatings or Zinc Clad XI by Sherwin Williams.

.11 Drilled inserts: Mega by ITW Construction Products or HSL by Hilti Inc. heavy-duty anchors, sizes as shown.

.12 Isolation coating: Bitumastic coating, acid and alkali resistant material.

.13 Heat strengthened/laminated glass: In accordance with Section 08 80 00.

.14 Finishes:
- .1 Field painting (interior): All interior metal fabrications are to be finished with a high performance latex finish in accordance with Section 09 91 00.
- .2 Steel coating system (exterior): All metal fabrications exposed to exterior are to be galvanized and finished with exterior steel coating in accordance with Section 09 97 13.

.15 Gate hardware: Provide all hardware as required for roof gate, including but not limited to heavy duty Type 316 stainless steel hinges, pad-lock hasp and throw bolt.

2.2 FABRICATION

.1 Verify dimensions of existing Work before commencing fabrications and report any discrepancies to the Consultant.

.2 Fit and assemble work in shop where possible. Execute work in accordance with details and reviewed shop drawings.

.3 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated. Use welded connections for interior metal work and exterior metal work unless otherwise found acceptable by the Consultant.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications against corrosion in accordance with CAN/CSA S16.1-M.

.5 Execute shop welding to requirements specified .

.6 Carefully make and fit details. Take special care with exposed finished work to produce a neat and correct appearance to the Consultant's acceptance.

.7 Assemble members without twists or open joints.

.8 Correctly size holes for connecting work of other trades where such can be determined prior to fabrication. Where possible, show holes on shop drawings. Place holes not to cause appreciable reduction in strength of member.

.9 Draw mechanical joints to hairline tightness and seal countersunk screw and access holes for locking screws with metal filler where these occur on exposed surfaces.

2.3 FABRICATED ITEMS

.1 Refer to Drawings for details of metal fabrication work and related items not specifically listed in this Section.

.2 Where work is required to be built into work of other Sections supply such members to respective Sections.

.3 Provide metal fabrication items indicated below and items not indicated to be supplied under other Sections. The following items includes miscellaneous and metal fabrication including but not limited to the items listed below.

.4 Metal pan stairs:

.1 Fabricate steel channel stringer of size, construction and attachment to structure as shown. Close exposed ends of stringers with 3 mm thick steel closure plates welded to edges of exposed flange edges.

.2 Furnish treads, risers and landing permanent metal forms of steel sheet formed as shown; treads to be concrete filled in accordance with Division 3, with bare metal riser incorporating 19 mm dust cove. Fabricate landings for concrete fill of same material as stair treads, unless ribbed metal deck form is shown.

.3 Support treads, risers and landings as detailed on reviewed shop drawings.

.5 Handrails, guardrails, and posts:

.1 Design guardrails to withstand minimum horizontal and vertical loads as required to meet requirements of authorities having jurisdiction. In no instance shall load design of guardrails be less than 3.0 kN/m horizontally and 1.5 kN/m vertically.

.2 Close open ends of steel handrails with 1.9 mm thick closure neatly welded. Fabricate handrails, guardrails and posts as shown on drawings.

.3 Handrail bracket: Fabricate as shown. After fabrication, galvanized bracket in accordance with ASTM A123 for interior and exterior applications.

.6 Lintels: Fabricated from CAN/CSA-G40.20/G40.21-M, Grade 350W, size and location as required for intended application, width to be not less than 25 mm less than width of wall and extend 200 mm beyond opening at each end.

.7 Support framing for exterior soffits: Structural channel and angle framing continuously welded and securely anchored back to structure. Design framing and anchorage to support assembly dead loads and live loads, and lateral loads. Finish: Prime painted.

.8 Ladders:

.1 Fabricate ladders as shown on Contract Drawings, to assist in accessing roofs and light wells, and in compliance with authorities having jurisdiction.

.2 Extendible aluminum ladders:

.1 Provide ladder with extendable arms and handrails as user ascends up ladder to roof location, for ladders in Stair B and Janitor Room 204.

.2 Fabricate heavy duty aluminum ladders complete with stiffeners, rungs, angle rails, bent plate straps or angle brackets, extendible rails and rung locks.

.3 Ladder in Stair B shall have the capability of being pulled upwards to prevent accessibility to children at ladder bottom.

.4 Extendible ladders as manufactured by Acklands Grainger or approved alternative.

.3 Exterior steel ladders:

.1 Provide exterior steel ladder at light well as shown on Contract Drawings.

.2 Fabricate galvanized steel ladders complete with steel stiffeners, rungs, angle rails, bent plate straps or angle brackets as shown.

.9 Upholstery seating and bench supports:

.1 Supply only, for installation under work of Section 06 20 00, upholstery seating and bench supports constructed of steel plates of sizes noted. Provide supports at maximum 600 mm centres and not less than 150 mm from ends of seat run.

.2 Construct supports as detailed. Provide all drill holes required for concealed anchorage of seating and for anchoring to building structure.

.10 Aluminum plates (ALUM):

.1 Fabricate 3 mm thick prepainted extruded aluminum built-up plates with square inside corners and vestibule plate cladding in accordance with Contract Drawings, with specified colour.

.2 Plates shall be fastened with countersunk fasteners.

.3 Fabricate plates flat, true, free of marks, without visible distortion and with edges straight and true. Make all planes true, and corners square and bend of minimum radius.

.4 Install aluminum plates plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.

.5 Provide end closures as detailed.

.11 Aluminum bases (ALB):
- .1 Fabricate 3 mm thick clear anodized extruded aluminum in accordance with Contract Drawings, 100 mm high.
- .2 Bases shall be fastened to wall substrate with countersunk fasteners.
- .3 Fabricate bases flat, true, free of marks, without visible distortion and with edges straight and true. Make all planes true, and corners square and bend of minimum radius.
- .4 Install bases plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.

.12 Glazed hollow metal and wood screen supports: Provide steel supports for glazed hollow metal and wood screens as required, continuously welded and securely anchored back to structure. Coordinate with applicable Sections as required for sizing and installation of supports for intended screen application.

.13 Rooftop equipment supports: Provide galvanized steel supports for rooftop equipment as required for the Work. Coordinate with applicable Sections as required for sizing and installation of metal supports at applicable rooftop equipment.

14. Glazed guard:
- .1 Fabricate glazed guard in accordance with reviewed shop drawings with galvanized and painted steel framing and posts.
- .2 Install heat strengthened/laminated glass material in framing in accordance with requirements of Section 08 80 00, for perfect alignment with uniform bit and joints between panels, shim and wedge into place.
- .3 Finish: Exterior steel coating for galvanized steel guard components in accordance with Section 09 97 13.

.15 Stainless steel millwork cladding and integral custom sinks:
- .1 Provide 1.9 mm (14 ga.) thick stainless steel sheet cladding materials for millwork counters as required. Coordinate with Section 06 20 00 as required for sizing, installation and cut-outs.
- .2 Make allowances around periphery and where fixed objects pass through or project into countertop material to permit normal movement without restriction.
- .3 Edges shall be returned.
- .4 Cove internal corners of sheet metal to 12 mm radius.
- .5 Joints will be watertight.
- .6 Integral sinks:
  - .1 Provide custom integral stainless steel sinks at triple sink in basement kitchen as shown on Contract Drawings, complete with cut-outs as required for fittings and accessories.
  - .2 Coordinate with Division 22 as required for plumbing work and drains for sink application.
  - .3 Fabricate stainless steel sinks from type 316 stainless steel, welded construction without solder or fill.
  - .4 Make sink integral in stainless steel countertop.

.16 Snow guard:
- .1 Provide snow guard as shown on Contract Drawings fabricated from Type 316 stainless steel.
- .2 Install snow guard in accordance with reviewed shop drawings.

.17 HSS table supports: Provide HSS supports for table in basement kitchen as shown. Coordinate with Section 06 20 00 as required for sizing and installation of supports for intended table.

.18 Miscellaneous steel brackets, supports and angles:
- .1 Supply and install or supply for installation by trades responsible, all loose steel brackets, supports and angles where indicated, except where such brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts.
- .2 Unless otherwise specified, prime paint for interior installation; galvanized finish for exterior installation.

.19 Elevator pit ladders and hoist beams: To be provided by elevator manufacturer under Section 14 21 23 and installed by this Section. Coordinate with noted Section as required for installation of said items.

.20 Access gate:
- .1 Provide access gate (R100) on roof, fabricated of galvanized steel sections as shown on Contract Drawings and complete with pad lock, hasp and throw-bolt. Coordinate with Section 07 46 19 as required for metal siding at gate.
- .2 Fabricate and install access gate in accordance with reviewed shop drawings.
- .3 Ensure gate materials are installed straight, smooth, plumb and free of buckles and defects in appearance.
- .4 Adjust gate as required for smooth and efficient operation.
- .5 Finish: Exterior steel coating for galvanized steel components in accordance with Section 09 97 13.

2.4 STAINLESS STEEL WORK

.1 Take all necessary precautions to safeguard against latent surface discolouration due to disturbance of the natural protective oxide coating of the material or to contamination from other sources.

.2 Workmanship shall be the best standard practice for this type of work. Execute stainless steel work in accordance with the applicable instructions set forth in Atlas Stainless Steels' "Technical Data" handbook on stainless steel.

.3 Do all stainless steel fabrication in clean shops, located away from areas where carbon steel is burnt, ground, or cut with abrasive wheels to ensure that carbon steel dust will not be embedded into the stainless steel, and as follows:
- .1 In fabrication of stainless steel do not use tools and dies which have been used on carbon steels.
- .2 Ensure tools and dies use for forming and cutting stainless steel are free of nicks and other damage.

.3 Do not use carbon grits and grinding wheels which will imbed foreign particles into stainless steel surfaces. Use only stainless steel wool when wool polishing is required.

.4 Stainless steel items, on which rust stains appear, shall be replaced with new fabricated material.

2.5 ANCHORS AND FASTENING

.1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.

.2 Use self drilling expansion type concrete anchors for attaching to masonry and concrete

.3 Do not secure items to steel deck.

.4 Use steel beam clamps of two bolt design to transmit load to beam web. Do not use C and I clamps.

2.6 WELDING

.1 Perform welding by electric arc process.

.2 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:

.1 CSA W48 - for Electrodes. If rods are used, only coated rods are allowed.

.2 CSA W59-M and CSA W59S1-M for design of connections and workmanship.

.3 CAN/CSA W117.2-M - for safety.

.3 Thoroughly clean welded joints and expose steel for a sufficient distance to perform welding operations. Finish welds smooth. Supply continuous and ground welds which will be exposed to view and finish paint.

.4 Test welds for conformance and remove work not meeting specified standards and replace to Consultant's acceptance.

2.7 SHOP PAINTING

.1 Clean steel to SSPC SP6 and remove loose mill scale, weld flux and splatter.

.2 Shop prime steel with one coat of primer paint to dry film thickness of 0.07 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.

.3 Shop prime galvanized steel in accordance with CGSB 85-GP-16M.

.4 Clean but do not paint surfaces being welded in field.

.5 Do not paint surfaces embedded in concrete, but clean as if they were to be primed.

.6 Do not prime steel to be fireproofed or to receive intumescent paint coating.

.7 Do not prime machine finished surfaces, but apply an effective anti-rust compound.

.8 Take precautions to avoid damage to adjacent surfaces.

2.8 **HOT DIP GALVANIZING**

.1 All steel exposed to the exterior elements shall be hot dip galvanized.

.2 After fabrication, hot dip galvanize specific miscellaneous steel items. After galvanizing, plug relief vents air tight with appropriate aluminum plugs as suitable and required for intended metal fabricated item. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces and site welds with zinc rich primer in accordance with manufacturer's printed directions.

.3 Hot-dip galvanize members in accordance with requirements of the following ASTM, with minimum coating weights or thicknesses as follows:

.1 Rolled, pressed and forged steel shapes, plates, bars and strips: ASTM A123; average weight of zinc coating per square/metre of actual surface, for 4.8 mm and less thickness members 600 g/m^2 for 6 mm and heavier members 640 g/m^2.

.2 Iron and steel hardware: ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface, in accordance with ASTM A153,Table 1 for the various classes of materials used in the Work.

3 Execution

3.1 **EXAMINATION**

.1 Examine previously installed Work, upon which this Section depends, verify dimensions and condition of existing Work, and coordinate repairs, alterations, and rectification if necessary. Commencement of work of this Section is deemed to signify acceptance of existing, prior conditions.

.2 Obtain Consultant's written approval prior to field cutting or altering of structural members.

3.2 **ERECTION**

.1 Install metal fabrications in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Apply isolation coating at 0.8 mm dry film thickness to prevent corrosive or electrolytic action between dissimilar materials such as aluminum to concrete, masonry, galvanized steel and similar conditions.

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

.4 Perform drilling of concrete and steel as required to fasten work of this Section.

.5 Guardrails and handrails:
- .1 Erect guardrails and handrails in true vertical and horizontal planes, rigid, and free from whip.
- .2 Continuously weld connections for guardrails, and bolt directly to steel stringers as shown on contract Drawings.
- .3 Grind smooth all welds of steel guard pickets with sharp corners. Provide continuous welds where visible, ground smooth.

3.3 TOUCH UPS

.1 Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up shop primer damaged during transit and installation, with primer to match shop primer.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for rough carpentry work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM A325, Specification for Bolts Quenched/Tempered Steel Nominal Thread Diameter M16 - M36 For Structural Steel Joints.

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

.4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.5 ASTM F1482, Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring.

.6 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.

.7 CAN/CSA O80 Series M, Wood Preservation.

.8 CAN/CSA O86, Engineering Design in Wood (Limit States Design).

.9 CSA O121-M, Douglas Fir Plywood.

.10 CAN/CSA O122-M, Structural Glued-Laminated Timber.

.11 CAN/CSA O141, Softwood Lumber.

.12 CSA O151-M, Canadian Softwood Plywood.

.13 CSA O177, Qualification Code for Manufacturers.

.14 NLGA, Standard Grading Rules for Canadian Lumber, National Lumber Grades Authority.

1.3 **DESIGN REQUIREMENTS**

.1 Design structural lumber in accordance with the OBC and CAN/CSA O86 to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

.2 Design structural lumber in accordance with climatic design data for Toronto contained in Ontario Building Code.

1.4 SUBMITTALS

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data for structural lumber in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
  - .1 Elevations, sections, details, materials, grades, dimensions, gauges, finishes connections, and relationship to adjacent construction.
  - .2 Complete engineering design data confirming that Products meet design criteria specified.

.3 Reports and certificates:
- .1 Submit certification from an independent inspection company that manufacturer meet the requirements of CSA O177.
- .2 Submit written inspection and test report results five working days after each inspection.

1.5 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in work of comparable complexity and scope, to perform following services as part of work of this Section:
- .1 Design of structural lumber.
- .2 Review, stamp, and sign fabrication and erection shop drawings, design calculations.
- .3 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed shop drawings.

.2 Qualifications of manufacturer: Structural glued-laminated members shall be manufactured by a plant approved by the Canadian Standards Association for the specified work. Provide a certificate attesting to manufacture in compliance with the requirements of CSA O177 “Qualification Code for Manufacture of Structural Glued-Laminated Timber” and shall affix the authorized label to all structural members supplied.

.3 ‘I’-Joists:
- .1 Fabrication Plant: Approved by ICBO or Standards Council of Canada or certified testing agency.
- .2 I-Joists shall be manufactured under the supervision of a certified third party inspection agency selected by the Consultant and paid for by the manufacturer.

.4 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.

.5 Plywood identification: Grade mark in accordance with applicable CSA standards.

.6 Lumber quality: Carefully select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing or making proper connections.

.7 Moisture Content of wood at time of construction shall be 19% maximum.

.8 Each piece of pressure treated lumber and fire retardant treated lumber shall be shop marked with the pressure treatment brand and ULC monogram respectively, in accordance with CAN/CSA O80-M.

9. Dimensions of lumber shall conform to dressed sizes specified in CAN/CSA-0141 unless actual dimensions are otherwise indicated or specified.

10. Dimensional references to lumber on Drawings and in Specifications are to nominal sizes unless actual dimensions are indicated. Such actual dimensions shall be dry size.

.11 Lumber defects: Discard wood with defects which will render a piece unable to serve its intended function. Lumber will be rejected by Consultant for excessive warp, twist, bow, crook, mildew, fungus, or mould, as well as for improper cutting and fitting, whether or not it has been installed.

1.6 **ENVIRONMENTAL REQUIREMENTS**

1. When it is required that wood maintain dimensional stability and tolerances to ensure accurate installation of later work, store and install it only in dry areas, and where no further installation of moist materials is contemplated.

1.7 **PRODUCT DELIVERY, STORAGE AND HANDLING**

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

2 Products

2.1 **MATERIALS**

.1 General:
- .1 All materials under work of this Section, including but not limited to, adhesives are to have low VOC content limits.
- .2 Adhesives - Urea-formaldehyde-free glues.
- .3 All dimensional lumber and plywood to be FSC certified.

.2 Lumber: Softwood, G4S, moisture content 19% or less at time of installation, in accordance with the following:
- .1 Lumber shall be of same species and grade, equally seasoned and shall be processed and stamped at same mill.
- .2 CSA O141 and NLGA Standard Grading Rules for Canadian Lumber.
- .3 Board quality: Construction or better.
- .4 Dimension quality:
  - .1 Structural joists, planks, and framing: No. 1 Select Structural.
  - .2 Light framing: Construction.

.3 Plywood: CSA O121-M, G1S, T & G, standard construction, laminated with waterproof adhesive, exterior grade, Thickness as indicated on drawings.

4. Sheathing:
- .1 Douglas Fir, CSA 0121-M or CSA O151-M; Select-Tight Face, exterior grade, T & G, in thickness as shown.
- .2 Joint sealing tape: High quality, air resistant pressure sensitive adhesive tape, for use at seams and penetrations of all interior and exterior plywood sheathing. Sealing tape used for floor sheathing to be as recommended by flooring manufacturer.
- .3 Floor sheathing to have one fully sanded face and be recommended for use as underlayment for fully adhered resilient flooring. Underlayment panels used with resilient flooring must be free of any foreign material that may prohibit a secure bond or cause the discolouration of resilient flooring as defined by ASTM F1482.

.5 Roof lumber: NLGA, Construction grade light framing, Jack Pine, S4S, pressure treated to CAN/CSA-O80 series using copper based waterborne preservative treatment, impregnated to a net retention of 4 kg/ m^3 of preservative unless otherwise specified by preservative manufacturer.

.6 Glue laminated timber: To meet specified requirements of CSA O122:
- .1 Species group: As classified in CAN/CSA O86.
- .2 Stress grade:
  - .1 24f bending.
  - .2 18t tension.
  - .3 16c compression.
- .3 Service grade: Interior.
- .4 Appearance grade: Conforming to CSA O122-M, industrial quality.
- .5 Metal framing connections: Steel, as designed and supplied by prefabricated structural wood manufacturer. Finish with primer and one coat of alkyd enamel, manufacturer's standard.

.7 'I' joists:
- .1 Flanges: 'Microllam' laminated veneer lumber, manufactured according to the standards as specified in Report No. NER 126 or 2100f-1.8E or 2400f-2.OE MSR lumber. Moisture content shall be between 7 and 16%.
- .2 Web material: Plywood complying with PS 1-83 or CSA O121-M or Sturdiwood oriented strand board manufactured by Weyerhauser Canada Ltd. or approved alternative. Sturdiwood panels to be produced under a quality control program with inspections by the American Plywood Association (NER-108).

.3 Identify each joist by a stamp indicating the joist type, NER report number, CCMC number, manufacturer's name, plant number, PFS Corporation Logo (NER-251), and/or Warnock Hersey Professional Services Ltd. logo.
.4 Hangers: Galvanized sheet steel of design and gauge recommended by joist manufacturer.
.5 Acceptable Product: 'TJI Joists' by Weyerhaeuser.

.8 Surface applied wood preservative: Green coloured copper napthenate or 5% pentachlorophenol solution, water repellant preservative or same copper based preservative as used for shop impregnation, in accordance with CAN/CSA O80.

.9 Fire retardant treatment of lumber and plywood (interior and protected locations): 'Dricon FRT' fire retardant treatment by Biewer Lumber or approved alternative, conforming to ASTM E84, to provide a flame spread rating of 25 or less.

.10 Rough hardware: Conforming to ASTM F1667; Nails, bolts, screws, anchors, expansion shields, and other fastenings required to frame and fix rough carpentry as follows:
.1 Nails, spikes and staples: Spiral type.
.2 Bolts: ASTM A325; 12.7 mm diameter minimum with nuts and washers unless noted otherwise.
.3 Screws: Countersunk head, full thread type.
.4 Proprietary fasteners: Toggle bolts, expansion shields, lag bolts, screws, inorganic fibre plugs, recommended for purpose by manufacturer.
.5 Galvanize rough hardware used in fire treated wood and hardware exposed to the atmosphere.

.11 Fasteners for use in pressure treated wood: Provide hot dipped galvanized fasteners complying to ASTM A153 and connectors in accordance with ASTM A653, Class G185 for non-structural members. Provide type 304 or 316 stainless steel fasteners and connectors for use in Structural, pressure treated wood.

2.2 FABRICATION

.1 Solid stock lumber: Comply with CAN/CSA O86 for all fabrication and assembly of structural components. Machine sand surfaces exposed in the finished work. Hand sand to an even smooth surface free of scratches.

.2 Glue laminated members and 'I' joists: Fabricate in accordance with reviewed shop drawings and manufacturer's written instructions.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 GENERAL

.1 Lay out work carefully and to accommodate work of others. Cut and fit accurately: erect in position indicated by Drawings.

.2 Install rough carpentry to allow for expansion and contraction of the materials.

.3 Cut work into lengths as long as practicable and with square ends. Align, level, square, plumb, and secure work permanently in place. Brace work temporarily as required. Join work only over solid backing.

.4 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for bolthead and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before concealed by other work or at completion of Work.

.5 Provide anchors, bolts, and inserts required for attachment of the work of this Section, to those performing the work of other Sections and who are responsible for their installation.

.6 Do not attach work by wood plugs or blocking in concrete or masonry. Use lead shields, expansion shields, or similar methods only as approved by Consultant.

.7 LVL beams and columns may be used to replace build-ups if approved by Structural Engineer.

3.3 PREFABRICATED STRUCTURAL WOOD MEMBERS

.1 Erect prefabricated structural wood members in accordance with reviewed shop drawings and manufacturer written instructions.

.2 Prefabricated structural wood members shall fit together properly, without trimming, cutting, or any other unauthorized modifications. Report any discrepancies to Consultant.

.3 Exercise care to keep out-of-plane bending to a minimum. Bearing points must be level.

.4 Connect joists to beams using hangers. Do not toe nail. Do not force a hanger to it or modify it or the member.

.5 Use cables, spreader bars, or strong backs as required at designated lift points.

.6 Temporarily brace units until permanently installed and braced.

3.4 MISCELLANEOUS WOODWORK

.1 Fit and install wood furring, strapping, grounds and blocking. Adequately size, correctly place and conceal members for finishes, fitments and for work under other Sections. Do not assume that Drawings show required work exactly or completely. Anchor wood members securely in place.

.2 Install rough bucks, nailing strips and linings to rough openings as required for backing for frames and other work.

.3 Except where steel supports are specifically shown, provide wood blocking and supports in metal stud partitions for fastening of item such as casework and other wall mounted accessories. Have respective trades approve the location of such wood blocking.

.4 Bolt wood blocking or nailing strips to steel framing.

.5 Align and plumb faces of furring and blocking to tolerance of 1:600.

.6 Use fire retardant lumber for blocking/framing in ceiling\spaces, partitions and bulkheads.

.7 Provide concealed continuous wood blocking to support millwork items, televisions, Mechanical and Electrical devices and similar wall mounted equipment requiring wall reinforcement.

3.5 ROOF WOODWORK

.1 Install continuous wood nailers around roof perimeters, curbs and roof openings larger than 150 x 150 mm, and at edges of insulation as detailed. Install cut cant strips and continuous nailers on copings and curbs as detailed.

.2 Install roof woodwork as shown on Contract Drawings with plywood on top of sleepers below, pressure treated.

3.6 WALL STUDS

.1 Provide wood studs where and in sizes as shown on Contract Drawings, Structural Drawings and specifications and minimum requirements as specified herein.

.2 Place wall studs at right angles to the wall face, except that studs on the flat may be used in gable ends of roofs that contain only unfinished space or in non-load-bearing partitions.

.3 Design corners and intersections to provide adequate support for the vertical edges of interior and exterior cladding materials, and in no instance shall exterior corners be framed with less than the equivalent of 2 studs.

.4 Single studs may be used on either side of openings in non-load-bearing partitions, provided the studs extend from the top wall plate to the bottom wall plate.

.5 Double studs shall maintain the void between the aligned member to allow blown insulation between each line of studs. Minimum 50 mm.

3.7 **FRAMING OVER OPENINGS**

.1 Bridge openings in non-load-bearing walls with not less than 50 mm material the same width as the studs, securely nailed to adjacent stud.

.2 Bridge openings in load-bearing walls with lintels designed to carry the superimposed loads to adjacent studs.

.3 Where 2 or more members are used in lintels, fasten together with not less than 82 mm nails in a double row, with nails not more than 450 mm apart in each row and the lintel members may be separated by filler pieces.

3.8 **ROOF AND SOFFIT SHEATHING**

.1 Install plywood roof, and soffit sheathing as shown on Contract Drawings.

.2 Install with a 1.6 mm gap between sheets. Nail to strapping with common spiral galvanized nails.

.3 Where panel-type sheathing requires edge support, the support shall be not less than 50 mm x 50 mm blocking securely nailed between framing members or metal H clips. The supports are not required when tongued-and-grooved edged plywood is used.

.4 Plywood used as air control layer shall be sealed with a high quality tape at seams and all penetrations shall be properly sealed.

.5 Tape and seal all joints, screw holes, gaps, and around penetrations in sheathing to ensure a complete continuous air barrier system.

3.9 **FLOOR SHEATHING**

.1 Provide plywood floor sheathing over tongue and groove wood deck as shown on Contract Drawings, in thickness as indicated.

.2 Install floor sheathing in accordance with ASTM F1482 at resilient flooring applications.

.3 Lay plywood lengthwise across the subfloor. Use full size sheathing panels to minimize the joints. Stagger end joints from adjoining course and butt sheets to a moderate contact.

.4 Where the edges of panel type floor sheathing are required to be supported, such support shall consist of not less than 50 mm x 50 mm blocking or tongued and grooved edged plywood.

.5 When resilient flooring is to be applied directly to the plywood floor sheathing, install the plywood with common spiral galvanized nails.

.6 Neatly cut and fit around fixed constructions.

.7 Tape and seal all joints, screw holes, gaps, and around penetrations in sheathing as recommended by intended floor finish manufacturer.

3.10 **WALL SHEATHING**

.1 Install plywood wall sheathing as shown on Contract Drawings.

.2 Apply lumber wall sheathing so that all ends are supported with end joints staggered.

.3 Apply panel-type sheathing board so that vertical joints are staggered if the sheathing is applied horizontally and a gap of not less than 1.6 mm left between sheets of plywood.

.4 Tape and seal all joints, screw holes, gaps, and around penetrations in sheathing to ensure a complete continuous air barrier system.

3.11 **BACKBOARDS**

.1 Install plywood backboards, primed and painted white on both sides, with fire retardant paint.

.2 Use minimum 19 mm thick plywood on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

3.12 **FASTENERS**

.1 Frame, anchor, fasten, tie and brace members for required strength and rigidity.

.2 Use hot dipped galvanized fasteners for exterior work and work below grade.

.3 Countersink bolts and bolt heads as required for clearance of other work.

.4 Size fasteners to penetrate base member by half of fastener length minimum. Minimize splitting of wood members by staggering nails in direction of grain.

.5 For plywood use spiral, annular or resin coated nails and staples.

3.13 **SURFACE-APPLIED WOOD PRESERVATIVE**

.1 Treat raw surfaces, drilled holes and cut ends of pressure treated wood with 2 coats of wood preservative immediately after cutting.

.2 Apply preservative by dipping, by brush or by pouring into plugged holes to completely saturate surface.

END OF SECTION

1 General

1.1 **REFERENCES**

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM A123/A123M-[02], Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A653/A653M-[06], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian Standards Association (CSA International)
- .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
- .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
- .4 CSA O141-05, Softwood Lumber.
- .5 CSA O151-04, Canadian Softwood Plywood.
- .6 CSA O153-M1980 (R2003), Poplar Plywood.
- .7 CAN/CSA-O325.0-92(R2003), Construction Sheathing.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.4 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber [2005].

1.2 **SUBMITTALS**

.1 Submit Submittal submissions: in accordance with Section 01 33 00 - Submittal Procedures.

1.3 **QUALITY ASSURANCE**

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

1.4 **DELIVERY, STORAGE, AND HANDLING**

.1 Store materials in a dry conditions elevated from the earth. Keep material covered until use.

.2 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

2 Products

2.1 **PLANT BED DECKING**

LUMBER MATERIAL

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
- .1 CAN/CSA-O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 Forest Stewardship Council (FSC) certified.

.2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
- .1 Board sizes: "Standard" or better grade.
- .2 Dimension sizes: "Standard" light framing or better grade.
- .3 Post and timbers sizes: "Standard" or better grade.

FRAMING MATERIALS

.1 Pressure Treated Spruce/Pine: Beams, Joists and Bracing
- .1 Forest Stewardship Council (FSC) certified.

.2 Deck Frame Supports
- .1 Integral metal bracket.

DECKING MATERIALS

.1 Decking – Western Red Cedar, tight knots select cedar or approved equal.

ACCESSORIES

.1 Bolts: 15 mm diameter (5/8”) unless indicated otherwise, complete with nuts and lock washer washers.

.3 Deck fastening system: Deck Screws- min. 120mm.

FINISHES

.1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work.

.2 Stainless steel: use stainless steel 304.

3.1 **PREPARATION**

.1 Excavate and level with granular base

.2 Install precast element level and to support wood framing. Rebar precast element into ground through base material.

.3 Treat surfaces of material with wood preservative, before installation.

.4 Apply preservative by dipping, or by brush to completely saturate and maintain

wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

.5 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.6 Treat non-exposed material with preservative:
- .1 Wood cants, fascia backing, curbs, and nailers.
- .2 Wood furring for on outside surface of exterior masonry and concrete walls.
- .3 Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.

3.2 INSTALLATION

.1 Comply with requirements of NBC, supplemented by the following paragraphs.

.2 Align and plumb faces support pieces

.3 Install rough bucks, nailers and linings to rough openings as required.

.4 Dress and tapered decking material to meet dimension shown on the drawings.

.5 Install sleepers as indicated.

.6 Install using stainless steel deck screws.

3.3 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

.3 Provide for spacing of bench anchor plates, anchor hardware to framing before completion of decking. Measure anchor hardware spacing with on site to ensure accuracy of measurements.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products equipment and services necessary for the finish carpentry work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ANSI A208.1, Particleboard.

.2 ANSI/HPVA HP-1, Hardwood and Decorative Plywood.

.3 ANSI/NEMA LD 3, High-Pressure Decorative Laminates.

.4 APA - The Engineered Wood Association.

.5 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.6 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.

.7 Architectural Woodwork Manufacturers Association of Canada (AWMAC).

.8 Architectural Woodwork Standards (AWS) - Quality Standards for Architectural Woodwork.

.9 CAN/CSA O141, Softwood Lumber.

.10 CSA O151-M, Canadian Softwood Plywood.

.11 NFPA 260, Standard Methods of Tests and Classification System for Cigarette Ignition Resistance of Components of Upholstered Furniture.

.12 National Hardwood Lumber Association (NHLA) Rules for the Measurement and Inspection of Hardwood and Cypress.

.13 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber.

.14 UFAC, Upholstered Furniture Action Council.

1.3 SUBMITTALS

.1 Shop drawings: Submit shop drawings of finish carpentry work in accordance with Section 01 33 00 indicating materials, thicknesses, sizes, finishes, wood species, grades, profiles, connection attachments, shop jointing, field jointing, reinforcing, anchorage, fastener types and sizes, location of exposed fastenings, mechanical and electrical service routes, service outlets, cutout locations, and sizes. Include erection drawings, plans, elevations, sections, and details as applicable.

.2 Samples: Submit samples of the following in accordance with the requirements of Section 01 33 00:

- .1 Two representative pieces of each type of wood to receive a stained or natural finish.
- .2 Two representative pieces of each type of wood finished as specified.
- .3 Two 200 mm long samples of wood frame corner demonstrating squared dovetail joint for the Consultant’s approval.
- .4 Two of each colour, pattern, gloss, and texture of plastic laminate, in manufacturer's standard tag size.
- .5 Two of each colour, pattern, gloss, and texture of markerboard laminate, in manufacturer's standard tag size.
- .6 Two samples of laminated plastic joints, edging, cutouts and profiles.
- .7 Two samples of melamine surfaced board, edging and postformed profiles.
- .8 Two of each quartz surface, in 100 x 75 x 19 mm samples.
- .9 Two of upholstery fabric, in 100 x 100 mm samples.
- .10 Two of wainscot trim, in 100 mm long samples.
- .11 One of each item of finish carpentry hardware.

1.4 QUALITY ASSURANCE

.1 Execute work of this Section by member of AWMAC, with 5 years experience in finish carpentry work of comparable complexity and scope. Submit proof of experience upon Consultant’s request.

.2 Fabricate finish carpentry work in accordance with AWS Quality Standards, Premium Quality materials and installation unless otherwise indicated. Perform work in accordance with the definition of Good Workmanship as defined in the AWS Quality Standards.

.3 Remove and replace finish carpentry work which does not conform to the AWS Quality standards or as amended by these Specifications.

.4 Mock-up:

- .1 Shop fabricate one mock-up of a base cabinet, wall cabinet, and counter top for each type of surfacing specified, complete with hardware and shop applied finishes, installed in location acceptable to Consultant.
- .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.

.3 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.5 **DELIVERY, STORAGE, AND HANDLING**

.1 Deliver, store, and handle finish carpentry in accordance with the AWS Quality Standards. Control the temperature and humidity in accordance with the AWS recommendations, before, during, and after finish carpentry delivery, and also during storage and installation.

.2 Cover finished plastic laminated work with heavy kraft paper or put in cartons during shipment. Protect installed surfaces by approved means. Do not remove until immediately before final inspection.

2 Products

2.1 **MATERIALS**

.1 General:
- .1 All materials under work of this Section, including but not limited to, adhesives and mastics, are to have low VOC content limits.
- .2 Adhesives - Urea-formaldehyde-free glues.
- .3 All dimensional lumber and plywood to be FSC certified.
- .4 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.

.2 Concealed framing lumber and plywood:
- .1 Eastern Spruce, Balsam Fir, or Jack Pine, to CAN/CSA O141, NLGA, and AWS Custom Grade, S4S, average moisture content 7% +/- 2% at installation.
- .2 Softwood plywood: CSA O151-M; 19 mm unless indicated otherwise, (G2S).

.3 Hardwood lumber: Rift cut White Oak, to NHLA and AWS Premium Grade, S4S, average moisture content 7% +/- 2% at installation.

.4 Paint grade lumber: Paint grade Birch or Poplar to NHLA and AWS Premium Grade, S4S, average moisture content 7% +/- 2% at installation.

.5 Plastic laminate (PLAM): Provide plastic laminates conforming to ANSI/NEMA LD 3 as follows:
- .1 Flatwork face sheet: 1.2 mm thick, heavy wear resistance.
- .2 Vertical interior face sheets: 0.8 mm thick.
- .3 Backing sheet: thickness to match face sheet, high pressure laminate, manufactured by same manufacturer as face sheet.
- .4 Plastic laminate: As manufactured by Wilsonart.

.5 Plastic laminate types, colours and finishes as follows:
.1 Plastic laminate (PLAM 1): 'Frosty White (1573-60)' colour by Wilsonart in matte finish.
.2 Plastic laminate (PLAM 2): 'Charcoal Velvet (15504-31)' colour by Wilsonart in traceless finish with fingerprint resistant technology.
.3 Plastic laminate (PLAM 3): 'Fashion Grey (D381-60)' colour by Wilsonart in matte finish.
.6 Edging to be done in 3 mm thick PVC to match laminate colour, having squared edges.

.6 Whiteboard wainscot (WW): 1.2 mm thick markerboard laminate on MDF substrate in thickness as indicated, 'Wilsonart Markerboard' by Wilsonart, in 'Frosty White 1573-09'. For use on whiteboard wainscot walls where indicated.

.7 Plastic laminate wainscot (PW): Standard plastic laminate on MDF substrate in thickness as indicated, plastic laminate PLAM-1 by Wilsonart as specified herein. For use on plastic laminate wainscot walls where indicated.

.8 Wainscot panel (PW or WW) trims and accessories:
.1 Z-mold reveal: Z mold reveal used in conjunction with wainscot panels shall provided under work of Section 09 21 16.
.2 Millwork reveal L angle: Formed from extruded aluminum alloy 6063 T5, clear anodized finish, for L reveal angle at wainscot panels, 'MWRL 75' manufactured by Fry Reglet or approved alternative.
.3 Metal cleats: 6 mm deep metal Z cleats, 'MWCleat 25' manufactured by Fry Reglet or approved alternative.

9. Melamine Surfaced Particleboard: ANSI A208.1, Grade M2, contains 100% post-industrial wood fibres, no urea-formaldehyde. Edging to be done in 3 mm thick PVC to match melamine colour. 'Nu Green Particleboard' by Uniboard Canada Inc. or approved alternative, having the following minimum criteria:
.1 Density: 635 kg/m^3.
.2 Modulus of rupture: 14.5 N/mm^2.
.3 Modulus of elasticity: 2, 250 N/mm^2.
.4 Internal bond: 0.45 N/mm^2.
.5 Hardness: 2,225 N.
.6 Linear expansion: < 35%.
.7 Formaldehyde emissions: 0.00-0.01 ppm.
.8 Melamine facing: 'Panval Melamine' by Uniboard Canada Inc. or approved alternative. Colours as follows:
.1 Interior millwork surfaces: White.

.10 Hardwood decorative plywood:
- .1 Hardwood plywood conforming to ANSI/HPVA HP-1.
- .2 Plywood grade: APA plywood, Grade A-A, in sizes, thickness and shapes as indicated.
- .3 Wood veneer:
  - .1 Rift cut White Oak, conforming to ANSI/HPVA HP-1 having finishes and meeting grades as follows:
    - .1 Opaque finish, Grade B.
  - .2 Sizes, thickness, and shapes as indicated.
- .4 For use at wood transom panels and any additional areas as indicated.

.11 Marine grade plywood: CSA O151-M, G1S, T & G, composed entirely of Douglas Fir or Western Larch, laminated with structural waterproof adhesive, exterior grade. Thickness and locations as indicated on the Drawings. For use as core substrates of window sills, wet counters, wall panels and additional areas as indicated.

.12 Veneer core plywood (substrate): APA plywood, Grade A-D, in sizes, thickness and shapes as indicated.

.13 Engineered quartz countertop (QS):
- .1 Crushed quartz combined with polyester resins and pigments formed into minimum 19 mm thick dense non-porous slabs with polished finish. 'Wilsonart Quartz' by Wilsonart or approved alternative.
- .2 Quartz types and colours as follows:
  - .1 Quartz (QS.1): 'Serene (Q1001)' colour.
  - .2 Quartz (QS.2): 'Grey Lake (Q1009)' colour.

.14 Upholstery fabric and seat materials:
- .1 Upholstery fabrics:
  - .1 Fabric (Type 1): Conforming to NFPA 260 (UFAC), Class 1, 100% vinyl fabric with 100,000 Wyzenbeek for abrasion, 'Designtex Extreme Performance Sorano 3403-802' by Designtex or approved alternative, in 'Keystone (Charcoal grey)' colour with 'PreFixx Stain Resistant' finish.
  - .2 Fabric (Type 2): 'Maxwell Fabric CDA042 Classic (contract Vinyl) White' by Maxwell Fabric (supplied by Inside Fabric) or approved alternative, colour to be confirmed by the Consultant. Allow for a cost of $50.00/yard.
- .2 Foam padding: Commercial grade heavy duty polyurethane foam with a density of 32 to 34 kg/m^3 and meeting code requirements for flammability.
- .3 Hold-down strips: 19 mm wide 'velcro', colour to match fabric colour as close as possible.

.15 Laminating adhesive: CSA O112 Series, water resistant type, low VOC content, selected by laminate manufacturer for intended end use.

.16 Draw bolts and splines: Type as recommended by fabricator.

.17 Nails and staples: Conforming to ASTM F1667; Size and type to suit application, galvanized for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.18 Bolts, nuts, washers, blind fasteners, lags and screws: Size and type to suit application. Stapling is not acceptable.

.19 Adhesive and bituminous mastic: Selected by the millwork fabricator with low VOC content.

.20 Miscellaneous metals: In accordance with Section 05 50 00.

.21 Glass and glazing materials: In accordance with Section 08 80 00.

.22 Finishing: In accordance with Section 09 91 00.

2.2 **HARDWARE**

.1 The following hardware is the minimum quality standard for the work of this Section. Alternatives may be considered provided they are approved by Consultant prior to ordering of products.

.2 Drawer slides: Full extension, 8400 Series by Knape & Vogt.

.3 Pilasters: Clear anodized aluminum recessed shelf standards with 12 mm divisions, Model 233 by Knape & Vogt.

.4 Clips: Bright zinc plated, adjustable height shelf supports, Model 256 by Knape & Vogt.

.5 Cabinet hinges: Heavy duty, concealed, 155 degree, soft close, clip-top and mounting plate system, ‘Blumotion, Model No. 71B7590 + 175H9160' by Blum.

.6 Elbow catch: Aluminum elbow catch with satin anodized finish, ‘Elbow Catch-Standard Duty-2A92' by Richelieu Hardware.

.7 Drawer and cabinet pulls: 100 mm high, ‘D’ type stainless steel pulls for easy grasp, ‘CBH 220 - C32D' by Canadian Builders Hardware.

.8 Magnetic catches: Model 918 by Knape & Vogt.

.9 Locks:
- .1 Cam locks/deadbolt locks complete with lock core by Hafele, type to suit application and installation.
- .2 All millwork shall be lockable.
- .3 All millwork shall be common keyed, unless otherwise specified herein.
- .4 Supervisor’s office and staff cabinets/lockers to be individually keyed.
- .5 Provide childproof magnetic locking system Tot Locks (Richelieu’s ‘T20130' and ‘T20330'), for all lower cabinets in playrooms.
- .6 Cabinet locks within same room shall be keyed alike.

.7 All other (non-playroom) lower cabinets are to be lockable by master key.

.10 Closet rod and supports: 14 ga. thick, round chrome steel closet rod with 27 mm diameter, complete with end supports. 'Round Rod - Sturdy Chrome Steel (1211612140)' and 'Closet Rod Supports (2211602140)' by Richelieu Hardware.

.11 Sliding window glass track and hardware:
- .1 Provide sliding glass track and hardware for installation with wood frame at display case as shown on Contract Drawings.
- .2 Extruded aluminum track with satin anodized finish and hardware set including rollers, push lock, silencers and end cap, 'Track Set for Display Glass Sliding Doors (1551210)' and 'Hardware Set for Showcase Display (BP15510)' by Richelieu Hardware.

.12 Cable grommets: 40 mm diameter, round, one-piece, press fitting type, white and black coloured metal grommets in colours to match countertop finish, 'Metal Cable Grommets' by manufactured by Hafele.

.13 Adjustable millwork legs: 121 mm high, aluminum die-cast adjustable furniture legs with white plastic guide and matte finish, complete with thread mounting. 'Furniture Foot' by Hafele or approved alternative.

.14 Removable drip tray/drying racks:
- .1 Provide durable and corrosion resistant stainless steel trays and racks as approved by the Consultant.
- .2 Drying rack: Provide stainless steel open wire drying rack under toy washing sink in playrooms.
- .3 Sizes to suit application.

.15 Coat hooks (CH):
- .1 Anodized aluminum coat hook with matt finish and silver colour, 18 mm wide x 60 mm high x 35 mm deep. 'Item 842.01.909' by Hafele.
- .2 Provide two per cubby and as shown on Contract Drawings.

.16 Concealed wall cleats: Concealed aluminum wall cleats, lengths to suit installations; provide minimum two (2) horizontal rows at wainscotting. 'Monarch Z Clips MF 625' by Monarch Metal.

2.3 PLASTIC LAMINATE WORK

.1 Perform plastic laminate work in accordance with AWS Quality Standards and ANSI/NEMA LD 3.

.2 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.3 Laminate plastic laminates to core materials in accordance with manufacturer's instructions.

.4 Fabricate core surfaces and profiles with continuous support and bond over entire surface to receive plastic laminate.

.5 Apply plastic laminate backing sheets to balance shrinkage stresses induced by plastic laminate face sheets.

.6 Minimize joints in plastic laminate work; do not install joints in plastic laminate work in less than 2400 mm o.c. Locate joints minimum 610 mm from cut-outs. Offset core and plastic laminate facing joints.

.7 Form shaped profiles and bends as indicated, laminating manufacturer's instructions.

.8 Edging to be done using 3 mm thick PVC to match plastic laminate colour to cover exposed edge of core material. Edging to be square. Do not mitre laminate edges.

.9 Unless otherwise indicated, apply melamine to interior of cabinetry. Provide plastic laminate finish to all exposed visible faces including open cupboards and shelving.

.10 Fabricate units by quartz surfacing manufacturer's certified or approved fabricator/ installer. Fabricate built-up profiles as indicated.

2.4 **FABRICATION**

.1 Finish carpentry Work required by this Section are as shown on the Millwork Schedule and to include but not be limited to the following items:
- .1 Countertops and cabinets.
- .2 Shelving.
- .3 Wall panels, wainscot panels.
- .4 Window sills.
- .5 Doors frames.
- .6 Glazed wood screens, sidelites and wood transoms.
- .7 Cubbies.
- .8 Upholstered and bench seating.
- .9 Display cases.

.2 Be responsible for methods of construction and for ensuring that materials are rigidly and securely attached and will not be loosened by the work of other sections.

.3 Coordinate locations of concealed supports and blocking with other parts of work. Provide cutouts for outlet boxes and other fixtures.

.4 Fabricate work in a manner which will permit expansion and contraction of the materials without visible open joints. Conceal joints and connections in wherever possible.

.5 Set nails and countersink screws, apply wood filler to indentations, sand smooth and leave ready to receive finish.

.6 Provide square corners with dovetail joint, no end grain shall be visible in completed installation.

.7 Finish millwork in accordance with Section 09 91 00. Finished millwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects and shall be selected for uniformity of colour, grain and texture.

.8 Shelving to cabinetwork to be adjustable unless otherwise noted.

.9 Recess shelf standards, unless noted otherwise. Stagger recessed shelf standards on opposite sides of divider.

.10 Do not exceed maximum 760 mm unsupported span for 19 mm thick shelving. House fixed shelving into gables and divisions.

.11 Shop assemble finish carpentry to accommodate delivery and handling and to ensure passage through building openings.

.12 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.

.13 Window sills:
- .1 Unless otherwise indicated. provide all plastic laminated faced interior window sills and aprons where indicated and as detailed, using plastic laminate PLAM-3 and 19 mm thick marine grade plywood core substrate, complete with specified 3 mm thick PVC edging.
- .2 Conceal all fixings.
- .3 Provide all solid continuous blocking and shims required for installation.

.14 Glazed wood screens, sidelites and transoms:
- .1 Fabricate built-up, stain grade rift cut solid White Oak wood as indicated, glazed screens complete with removable wood stops on room side of screen. Profile as shown on Contract Drawings.
- .2 Coordinate sizing and installation of wood screens, sidelites and transoms with work of Sections 08 14 16 as required for adjoining wood door assemblies and Section 08 80 00 for required glazing.
- .3 Fixed wood transoms shall be installed above 2400 mm high solid wood doors provided by Section 08 14 16 to meet the typical 2700 mm frame height.
- .4 Provide custom glass lite wood stop detail as shown on Contract Drawings.

.15 Cubbies: Provide cubbies in configuration and sizing as shown, complete with an area for staff to affix labels and two coat hooks per cubby unit.

.16 Upholstered and bench seating:
- .1 Provide upholstery vinyl fabric as indicated for upholstering seat cushions in lobby area as shown on Contract Drawings.
- .2 Each cushion shall be 50 mm thick in depth and length as shown on Contract Drawings.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install work in accordance with AWS Quality Standards and tolerances for Architectural Woodwork. Set and secure finish carpentry in place, rigid, plumb, square, and level.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate columns, fixtures, outlets, or other projecting, intersecting or penetrating objects leaving a 0.8 mm gap maximum.

.3 Coordinate cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures, in finish carpentry. Round internal corners of cut-outs and seal exposed cores.

.4 Form joints to conceal shrinkage.

.5 Install draw bolts and splines in laminated plastic counter top joints at maximum spacing 450 mm o.c., and 75 mm from edge. Make joints flush, hairline butt joints.

.6 Install finishing hardware accurately and securely in accordance with manufacturer's directions, adjust and clean.

.7 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.

.8 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.

.9 Melamine panels: Assemble melamine millwork using dowelled/wafered-and-glue construction. Installed melamine panels shall not show any exposed fasteners on finished/exposed surfaces.

.10 Quartz surfacing:
- .1 Install quartz surfacing in accordance with manufacturer's instructions.
- .2 Align work plumb and level.
- .3 Seal perimeter of fabrication to adjacent construction in accordance with Section 07 92 00.

.11 Wall and wainscot panels:
- .1 Install wall and wainscot panels in locations indicated on drawings complete with blackboard paint where indicated and as specified in Section 09 91 00.
- .2 Ensure that panels are securely fastened in true vertical and horizontal manner.

.12 Cubbies: Ensure that cubbies are installed level, square and plumb.

.13 Door frames:
- .1 Butt and cope internal joints of door frames to make snug, tight, joint. Cut right angle joints with dovetail joints and square corners.
- .2 Fit backs of frames snugly to wall surfaces to eliminate cracks at junction of frame with walls.

.14 Glazed wood screens, sidelites and transoms:
- .1 Coordinate installation of glazed wood screens, sidelites and transoms with work of Sections 08 14 16 and 08 80 00.
- .2 Install wood screens, sidelites and transoms in locations indicated on drawings. Ensure that screens, sidelites and transoms are level and plumb when installed.
- .3 Glazing work for wood screens, sidelites and transoms to be installed under work of Section 08 80 00.
- .4 Transoms shall be screw fastened to frames for proper securement. Transoms shall not be inserted with pressure clips.

.15 Sills: Install window sills level, plumb and even in locations as indicated and ensure that sills are securely fastened.

.16 Upholstered and bench seating:
- .1 Provide upholstered and bench seating as shown on Contract Drawings.
- .2 Install bench brackets and supports as indicated on drawings and in accordance with Section 05 50 00.
- .3 Secure seat components with continuous rows of fold-down strips. Accurately place strips so that intimate contact is made with nesting seats so no portion of strip is left exposed.
- .4 Upholstered panels and sections shall remain securely in place with no signs of sagging.

.17 Fastening:
- .1 Coordinate wall securement, anchorage, and blocking for finish carpentry items.
- .2 Ensure sufficient blocking and anchorage for millwork items.
- .3 All millwork should be securely anchored to wall or floor to avoid tipping.
- .4 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
- .5 Design and select fasteners to be concealed type, to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .6 Provide heavy duty fixture attachments for wall mounted cabinets.
- .7 Conceal all fasteners: When screws are used, countersink in round clean-cut hole and plug with wood plug with finish to match adjacent finish. Set finishing nails to receive filler.
- .8 Do not use staples.

.18 Remove and replace damaged, marked, or stained finish carpentry.

.19 Adjust millwork hardware for smooth and efficient operation.

END OF SECTION

1 General

1.1 **CONFORMANCE**

.1 The General Conditions, Supplementary Conditions and the Requirements of Division 1, are part of this section and shall apply as if written herein.

.2 Shall comply with CSA Z614-2014

1.2 **RELATED WORK SPECIFIED ELSEWHERE**

.1 Section 01 30 00 – Administrative Requirements

.2 Section 03 30 00 - Cast in Place Concrete

.3 Section 05 50 00 – Metal Fabrication

1.3 **SUBMITTALS**

.1 Shop Drawings: Include plans, elevations, sections, post anchorage, attachment and bracing details as required.

.2 Installation procedures and instructions.

2 Products

2.1 **WATER PLAY TABLE (1)**

.1 All lumber shall be Western Red Cedar, free of warps and checks.

.2 All hardware including nails, spikes, bolts, threaded tie rods, lag screws and rails hangers shall be hot dipped galvanized and of the size or weight sufficient to ensure the structural stability of this work.

.3 Refer to drawings for sizing, casters and other components.

2.2 **MUD KITCHEN (1)**

.1 All lumber shall be Western Red Cedar, free of warps and checks.

.2 Must comply with CSA Z614 clause 9 for structural integrity.

.3 Refer to drawings for sizing and other components.

.4 Steel plate to be stainless steel 24 gauge (1/4” thick).

2.3 **WOOD TABLES AND STOOLS**

.1 Quantity –

.1 6 sets total

.2 Stumps shall be debarked White Oak.

.3 Refer to drawings for required sizes.

.4 Submit samples of all materials for approval upon request.

3 Execution

3.1 **INSTALLATION**

.1 Layout all work true to line and level, plumb and true. Accurately place supports and members in position and brace securely, to remain plumb and true until permanently fixed. Receive approval of all layout work by the LANDSCAPE ARCHITECT prior to commencement of construction.

.2 Ensure supports and members are capable of safely supporting imposed loads. Report any discrepancies immediately to the LANDSCAPE ARCHITECT.

.3 Make all cuts as required with clean sharp tools.

.4 Receive approval of all woodwork prior to finishing.

.5 Apply two coats of sealer to manufacturers recommendations.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for dampproofing work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM E96/E96M, Standard Test Methods for Water Vapor Transmission of Materials.

1.3 **SUBMITTALS**

.1 Product data:
.1 Submit manufacturer's Product data in accordance with Section 01 33 00 for each Product indicating:
.1 Installation details, physical properties and detailed application and installation instructions, marked as applicable to Work.

.2 Samples: Submit following samples in accordance with Section 01 33 00:
.1 Two 300 x 300 mm samples of dampproofing membrane.

.3 Certificates: Submit manufacturer's certification stating compliance with criteria specified and that Products are compatible.

1.4 **QUALITY ASSURANCE**

.1 Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

.2 Pre-installation meeting: Arrange with manufacturer's representative, Contractor, and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.5 **SITE CONDITIONS**

.1 Do not proceed with work when wind chill effect causes Product to set before correct curing takes place.

.2 Supply and install temporary protection and heating to maintain air temperature and structural base temperature at dampproofing installation area above 5 °C for 24 h before, during and 24 h after installation.

.3 Do not apply dampproofing in wet weather.

.4 Supply and install forced air circulation during installation and curing periods for enclosed applications.

1.6 **EXTENDED WARRANTY**

.1 Installer's warranty: Submit an extended written warranty for dampproofing work in accordance with the Conditions of the Contract, except that warranty period is extended to two (2) years from date of Substantial Performance of the Work.
- .1 Warrant that the fluid applied dampproofing membrane and membrane flashings will stay in place and remain leak proof.
- .2 Coverage: Complete replacement including effected adjacent Work.

.2 Manufacturer's warranty: Submit an extended written warranty for dampproofing work in accordance with the Conditions of the Contract, except that warranty period is extended to five (5) years from date of Substantial Performance of the Work.
- .1 Warrant the dampproofing membrane and membrane flashings for leak coverage as a result of faulty materials
- .2 Coverage: Complete replacement including effected adjacent Work.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 Henry Company Canada Inc.

.2 Or approved alternative by W. R. Meadows or approved alternative manufacturer.

2.2 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, primers are to have low VOC content limits.

.2 All components of the dampproofing system shall be supplied by one manufacturer.

.3 Asphalt primer:
- .1 Light bodied asphalt based material for priming surfaces for cold-applied dampproofing coatings, 37% solids by volume.
- .2 Asphalt primer '910-01 Penetrating Asphalt Primer' by Henry Company Canada Inc.

.4 Dampproofing:
- .1 Liquid applied medium consistency, solvent type waterproofing and dampproofing compound of selected asphalts and fibres permitting application in thick films; conforming to CAN/CGSB 37.16-M, 54% solids by volume.
- .2 Application temperature: Ambient (thickens at low temperature).
- .3 Water vapour permeance: ASTM E96, 2.9 ng/Pa.m2.s (0.05 perms).
- .4 Dampproof coating, '710-11 Dampproofing and Waterproofing Asphalt Coating' by Henry Company Canada Inc.

.5 Sealing compound: Polymer modified sealing compound; 'Polybitume 570-05' by Henry Company Canada Inc.

.6 Reinforcing fabric: Open weave, glass fibre reinforcing consisting of glass fibre yarn saturated with synthetic resins; '990-06 Yellow Jacket' by Henry Company Canada Inc.

.7 Insulation board: In accordance with Section 07 21 00.

.8 Drainage board: In accordance with Section 33 46 13.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Ensure that surfaces of concrete are dry and in accordance with manufacturer's instructions before applying dampproofing material.

3.2 **PREPARATION**

.1 Seal exterior joints between foundation walls and footings, cracks in foundation walls, and around penetrations through dampproofing with sealing compound. Apply sealing compound in accordance with manufacturer's instructions.

.2 Prime substrates to be dampproofed in accordance with manufacturer's written instructions.

3.3 **APPLICATION**

.1 Apply dampproofing in accordance with manufacturer's written instructions.

.2 Seal exterior joints between foundation walls and footings with sealing compound before applying dampproofing.

.3 Apply dampproofing in continuous, uniform coating to exterior side of foundation walls enclosing rooms below finished grade. Dampproof from 50 mm below finished grade level to and including tops of foundation walls and footings.

.4 Brush reinforcing fabric into place overlapping fabric 50 mm at all joints with a soft bristle brush, eliminating wrinkles, air pockets or blisters and ensuring full contact.

.5 Apply two additional coats of dampproofing and two layers of reinforcing fabric to vertical corners and construction joints for minimum width of 230 mm on each side, around penetrations and along pipes passing through walls for minimum of 230 mm.

.6 Apply a seal coat of dampproofing over entire area at minimum 1 l/m^2.

.7 Insulation and drainage boards: Install insulation board over dampproofing membrane in accordance with Section 07 21 00. Drainage board to be installed over insulation board in accordance with Section 33 46 13.

3.4 **CLEAN-UP**

.1 Clean, repair, or replace surfaces soiled or otherwise damaged in connection with work of this Section as directed by Consultant. Replace finishes or materials that cannot be cleaned to acceptance of Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for the application of cementitious waterproofing work in accordance with the Contract Documents.

1.2 **SUBMITTALS**

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, installation details, physical properties, detailed application and installation instructions, and limitations.
  - .2 Product transportation, storage, and handling requirements.

.2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating materials, details, dimensions, thickness, treatment of joints and cracks, protection, penetration details, and relationship to adjacent construction.

.3 Certificates:
- .1 Submit certifications for items required at least 4 weeks prior to installation of work of this Section.
- .2 Submit manufacturer's certification that waterproofing system materials and accessories supplied are compatible, meet Specification requirements and that installer is approved by membrane manufacturer.
- .3 Submit inspection reports, within 3 working days after each inspection, and certification by manufacturer confirming that installations are in accordance with manufacturer's requirements.

1.3 **QUALITY ASSURANCE**

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of cementitious waterproofing of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator’s current certificate of approval by the material manufacturer as proof of compliance.

.2 Cementitious waterproofing system shall be tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein:
- .1 Independent Laboratory: Testing shall be performed by an independent laboratory meeting the requirements of the Standards Council of Canada. Testing laboratory shall obtain all concrete samples and water proofing product samples.
- .2 Crystalline Penetration: Crystallizing capability of waterproofing material shall be evidenced by independent SEM (Scanning Electron Microscope) photographs documenting penetration of crystal-forming waterproofing material to a depth of 50 mm.

.3 Permeability:
- .1 Independent testing shall be performed according to U.S. Army Corps of Engineers CRD C48-73 "Permeability of Concrete".
- .2 Concrete samples (treated and untreated) to have design strength of 13.8 MPa and thickness of 50 mm. No admixtures permitted.
- .3 Coatings to have maximum thickness of 1 mm per coat with up to two coats permitted.
- .4 Samples to be pressure tested to 1.2 MPa (121.5 m head of water).
- .5 Treated samples, after crystalline growth has occurred, shall exhibit no measurable leakage.

.4 Chemical Resistance:
- .1 Independent testing shall be performed according to ASTM C267 "Chemical Resistance of Mortars" and ASTM C39 "Compressive Strength of Cylindrical Concrete Specimens".
- .2 Concrete samples (treated and untreated) to have design strength of 27.6 MPa. No admixtures permitted.
- .3 Coatings to have maximum thickness of 1 mm per coat with up to two coats permitted.
- .4 Untreated and treated specimens to be immersed for a minimum of 84 days in following chemical solutions: hydrochloric acid (3.5pH), brake fluid, transformer oil, ethylene glycol, toluene, caustic soda.
- .5 Treated specimens shall exhibit no detrimental effects after exposure, and shall have a minimum of 14% increase in compressive strength versus untreated control specimens.
- .6 Potable Water Approval: Independent testing shall be performed according to NSF Standard 61 and approval for use of waterproofing material on structures holding potable water shall be evidenced by NSF certification.

.3 Mock-up:
- .1 Construct one 2 m^2 mock-up of waterproofing in location acceptable to Consultant.
- .2 Demonstrate as a minimum one inside corner, one outside corners, surface preparation, and typical installation.
- .3 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
- .4 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

.4 Pre-installation meetings: Arrange with manufacturer's representative and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.4 **DELIVERY, STORAGE, AND HANDLING**

.1 Store packaged materials in original undamaged containers with manufacturers labels and seals intact, in dry enclosed area, off the ground. Prevent damage of materials during handling and storage.

.2 Handle and store materials in accordance with manufacturers written instructions.

1.5 **SITE CONDITIONS**

.1 Do not install work of this Section outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:
.1 Ambient air and surface temperature are below: 5°C.
.2 Precipitation: None.

.2 Ensure that temperature of substrate and its moisture content conforms to manufacturer's minimum requirements, before proceeding with work.

.3 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 24 hours before, during, and 24 hours after installation.

1.6 **EXTENDED WARRANTY**

.1 Submit an extended warranty for cementitious waterproofing work in accordance with the General Conditions of the Contract, except that warranty period is extended to five years from date of Substantial Performance of the Work. .
.1 Warrant work against leakage.
.2 Coverage: Complete replacement including affected adjacent Work.

2 Products

2.1 **MATERIALS**

.1 Cementitious waterproofing system:
.1 Furnish a waterproofing system comprising of cement quartz and other non-toxic chemicals, and additives which, on contact with moisture, produce a crystalline growth throughout the capillary voids in the concrete. 'Permaquik Crystalline Waterproofing' by Tremco, ‘Cem-Kote CW Plus’ by W.R. Meadows or equivalent product(s) by Xypex Chemical Corporation.
.2 Provide cementitious waterproofing where shown on Contract Drawings.

2.2 **MIXES**

.1 Mix waterproofing material, by volume with clean water free from salt and deleterious materials, to the required proportions and consistency in accordance with manufacturer's written recommendations to achieve.

.2 Mix waterproofing material in quantities that can be applied within 20 to 30 minutes from time of mixing.

.3 As mixture thickens, stir frequently, but do not add additional water. Do not mix bonding agents or admixtures with cementitious waterproofing materials.

3 Execution

3.1 EXAMINATION

.1 Verify that concrete surfaces are sound and clean, and that form release agents and materials used to cure the concrete are compatible with waterproofing treatment.

.2 Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints and cracks. Such defects to be repaired in accordance with manufacturer's written instructions.

.3 Verify condition and dimensions of previously installed work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PREPARATION

.1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance. Obtain manufacturer's approval of substrate in writing, submit copy to Consultant.

.2 Concrete surfaces to receive waterproofing shall have an open capillary system to provide tooth and suction, and shall be free from scale, excess form oil, laitance, curing compounds and foreign matter.

.3 Smooth surfaces or surfaces covered with excess form oil or other contaminants shall be washed, lightly sand-blasted, water-blasted, or acid etched with muriatic acid as necessary to provide a clean absorbent surface. Surfaces to be acid-etched shall be saturated with water prior to application of acid.

.4 Surface defects shall be repaired in accordance with manufacturer's instructions and as follows:

.1 Form Tie Holes, Construction Joints, Cracks: Chip out defective areas in a "U" shaped slot 25 mm wide and a minimum of 25 mm deep. Clean slot of debris and dust. Soak area with water and remove excess surface water. fill the foregoing with material suited for the purpose by the material manufacturer and finish flush to wall.

.2 Rock Pockets, Honeycombing or Other Defective Concrete: Rout out defective areas to sound concrete. Remove loose materials and saturate with water. Remove excess surface water and fill with material suited for the purpose by the material manufacturer and finish flush to wall.

.3 Prior to application of waterproofing treatment, thoroughly saturate concrete surfaces with clean water as required to ensure migration of crystalline chemicals into voids and capillary tracts of the concrete. Remove free surface water before application.

3.3 INSTALLATION

.1 Install cementitious waterproofing in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Construction Joints: Apply waterproofing in slurry form at a minimum rate of 1.0 kg/m^2 to joint surfaces between concrete pours. Moisten surfaces prior to slurry application. Where joint surfaces are not accessible prior to pouring new concrete, consult manufacturer for application procedure.

.3 Walls:
- .1 Apply waterproofing uniformly to concrete surfaces with semi-stiff bristle brush or broom, or suitable spray equipment.
- .2 Apply waterproofing in 2 coats to a minimum application rate of 1.0 kg/m^2.
- .3 When brushing, work slurry well into surface of the concrete, filling surface pores and hairline cracks. When spraying, hold nozzle close enough to ensure that slurry is forced into pores and hairline cracks.

.4 Slabs:
- .1 Remove ponding water on slab and allow concrete to dry to a damp appearance.
- .2 Over freshly floated concrete, broadcast waterproofing material dry onto concrete at time in initial set at a minimum rate of 1.0 kg/m^2. Float and then machine trowel concrete to a smooth, level and dense surface. Free from trowel marks, ridges, pinholes, and other defects.
- .3 If it is not possible to broadcast waterproofing onto slab, waterproofing can be installed in slurry form. Application would be similar to wall application specified herein.

3.4 CURING

.1 Begin curing as soon as waterproofing has hardened sufficiently so as not to be damaged by a fine spray. Cure waterproofing with a mist fog spray of clean water three times a day for 2 to 3 days, or cover treated surfaces with damp burlap for the prescribed period. In warm climates, more than three sprayings per day may be necessary to prevent excessive drying of coating.

.2 During the curing period, protect treated surfaces from damage by wind, sun, rain and temperatures below 2°C. If plastic sheeting is used for protection, it must be raised off of waterproofing coating to allow sufficient air circulation.

3.5 FIELD QUALITY CONTROL

.1 Flood test:
- .1 Do not conceal waterproofing until inspection and testing are completed to satisfaction of Consultant.
- .2 Temporarily plug drains and dam horizontal surface areas to be tested and flood with water to minimum depth of 50 mm.
- .3 Maintain flooded depth for 24 hours.
- .4 If leaks occur repair and retest.
- .5 Remove water at end of test.

3.6 CLEANING

.1 Clean to Consultant's approval, soiled surfaces, spatters, and damage caused by work of this Section.

.2 Check area drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for the thermal insulation work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.2 ASTM C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.3 ASTM C665, Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.4 ASTM C739, Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.

.5 CAN/ULC-S102.2, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

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

.7 CAN/ULC-S702, Mineral Fibre Thermal Insulation for Buildings.

.8 CAN/ULC-S703, Standard for Cellulose Fibre Insulation (CFI) for Buildings.

1.3 **SUBMITTALS**

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating characteristics, performance criteria, and limitations. Indicate installation requirements and techniques, storage, and handling criteria and installation procedure acceptable to manufacturer.

.2 Certification: Submit installer's certification verifying compliance with specification requirements.

1.4 **QUALITY ASSURANCE**

.1 Qualifications: Execute work of this Section by company specializing in thermal insulation work with minimum of three years, recent, documented experience, on work of comparable complexity and scope.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, adhesives are to have low VOC content limits.

2. Batt insulation (non-rated, thermal): CAN/ULC-S702, Type 1, friction fit; 'Unfaced Thermal and Sound Control Batts' by Johns Manville, 'EcoTouch Pink Fiberglas Insulation' by Owens Corning Canada or 'ComfortBatt' by Rockwool.

3. Batt insulation (fire-rated/acoustic): ASTM C665, Paperless, semi-rigid, spun stone wool fibre mats, of thickness as indicated on Contract Drawings, 'MinWool SAFB' by Johns Manville, 'SAFB Thermafiber' by Owens Corning Inc., 'Roxul AFB' by Rockwool or approved alternative.

.4 Standard extruded polystyrene insulation (XPS):
- .1 CAN/ULC-S701, Type 4; extruded polystyrene (XPS), ship-lapped edges. Thickness: As indicated on Drawings. 'Styrofoam SM' by Dupont de Nemours Inc. or 'Foamular C-300' by Owens Corning Canada Inc.
- .2 Comply with required thermal value (R value) of insulation as shown on Contract Drawings.
- .3 For below grade use at perimeter foundations.

5. Cement faced extruded polystyrene insulation :
- .1 CAN/ULC S701, Type 4; extruded, closed-cell, cellular, foamed polystyrene with ship-lapped edges, complete with 8 mm thick latex modified concrete face and joints filled for a final seamless appearance; 'WallGuard' by T Clear Corporation, 'Concrete Faced Insulated (CFI) Wall Panels' by Tech-Crete or approved alternative.
- .2 For exposed above grade use at perimeter foundations.

6. Expanded polystyrene insulation (EPS) - (under slabs):
- .1 ASTM C518, closed cell expanded polystyrene sheets in thickness as indicated on drawings.
- .2 Insulation to have a compressive strength (kPa) and thermal value (R value) as shown on Contract Drawings. 'Isolofoam XHD Series' by Isolofoam Group or approved alternative by Dupont de Nemours Inc., Owens Corning Canada Inc. or approved alternative manufacturer.
- .3 For use under slabs on grade.

7. High density extruded polystyrene insulation (XPS) - (footings, columns and structural mat foundations):
- .1 ASTM C578, closed cell extruded polystyrene sheets in thickness as indicated on drawings.
- .2 Insulation to have a compressive strength (kPa) and thermal value (R value) as shown on Contract Drawings. 'Styrofoam HI Load' by Dupont de Nemours Inc. or 'Foamular HI Load' by Owens Corning Canada Inc.
- .3 For use under footings, columns and structural mat foundations.

.8 Cellulose insulation:
- .1 Conforms to CAN/ULC-S102.2, CAN/ULC-S703 and ASTM C739, low VOC, thermal and acoustic cellulose insulation composed from 85% recycled newspapers and 15% flame-retardant minerals and is free of formaldehyde, asbestos and fibreglass, meeting an R value of 3.7 per inch.
- .2 'Sopra-Cellulose' by Soprema or approved alternative.
- .3 Insulation to be complete with cardboard strip 'Sopra-Cellulose Strip' and self-adhesive patch 'Sopra-Cellulose Patch' by Soprema and staples as required for wall injection of cellulose insulation.

9. Semi-rigid insulation:
- .1 Semi-rigid stone wool conforming to CAN/ULC-S702, Type 1, minimum density 70 kg/m^3, thickness as indicated. 'CavityRock MD' by Rockwool or approved alternative by Owens Corning Canada Inc. or approved alternative manufacturer.
- .2 Insulation fasteners or impaling pins installed as per manufacturer's written instructions.

10. Sprayed insulation: In accordance with Section 07 21 19.

11. Drainage board: In accordance with Section 33 46 13.

.12 Foundation insulation fastening system: Provide purpose made thermally broken plastic/fibreglass insulation fasteners, 'Manual Insulation Fasteners' by Unicon or approved alternative, size to suit insulation thickness.

3 Execution

3.1 EXAMINATION

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Ensure substrate surfaces are dry, clean, suitable to receive adhesive and free from other deleterious substances.

3.2 INSTALLATION

.1 Install thermal insulation in longest panel sizes possible in accordance with manufacturer's instructions.

.2 Butt insulation with moderate contact and, cut and fit them tightly around other construction elements. Offset single layer vertical joints and both vertical and horizontal joints in multiple layer applications.

.3 Make thermal insulation continuous, maintain thermal protection continuity and secure to prevent displacement. Ensure that insulation is tight to substrate without air gaps.

.4 Cut and fit thermal insulation tightly around electrical boxes, plumbing and heating pipes and ducts, exterior doors and windows, and other protrusions.

.5 Leave 75 mm separation between thermal insulation and heat emitting devices.

.6 Cut and trim thermal insulation neatly to fit spaces; do not compress insulation to fit. Install only thermal insulation boards which are free from chipped or broken edges.

.7 Fill miscellaneous cavities with insulation to maintain continuity of thermal barrier. Do not compress insulation to fit.

.8 Arrange for Consultant to review thermal insulation before it is enclosed.

3.3 **SECUREMENT**

.1 Batt insulation (fire-rated/acoustic):
- .1 Install batt insulation in partitions, between studs, and as indicated on Contract Drawings and in accordance with the manufacturer's instructions.
- .2 Fill stud cavities to full height of partitions and carefully cut and fit batt insulation around services and protrusions.

.2 Cellulose insulation:
- .1 Provide cellulose insulation in roof, exterior wall and parapet assemblies. Provide minimum thermal resistance value R value for roof assembly as indicated.
- .2 Installers shall conduct density testing in accordance with manufacturer's recommendation and provide reports upon Consultant’s request.
- .3 Roof assemblies:
  - .1 Blow in cellulose insulation in accordance with manufacturer’s written instructions with pneumatic blowing equipment and to 25 kg/m^3 (1.5 lb/ft^3) density to meet intended R value.
  - .2 Keep insulation minimum 75 mm from heat emitting devices and recessed light fixtures, and similar areas.
- .4 Wall and parapet assemblies:
  - .1 Secure retaining membrane to studs and cardboard strips to upright studs and cross members and then inject dry cellulose insulation with a manufacturer recommended mandatory nozzle into wall openings.
  - .2 Inject cellulose insulation into exterior wall and parapet assemblies in accordance with manufacturer’s written instructions and to 65 kg/m^3 (4.0 lb/$ft^{3)}$ density.
  - .3 Seal holes in membrane upon completion and density testing.
  - .4 For wall and parapet injection, cellulose insulation shall be injected to densities required and to suit intended wall and parapet thickness.

.3 Semi-rigid insulation:
- .1 Provide semi-rigid insulation in locations as required for Project and installed in accordance with manufacturer’s written instructions, with tight butt joints.
- .2 Coordinate with applicable Sections as required for installation of semi-rigid insulation.

.4 Extruded polystyrene insulation (XPS) - perimeter foundation insulation (standard and cement faced):
- .1 Exterior application: unless otherwise indicated, extend boards from full height of foundation wall to top of footing. Install on exterior face of perimeter foundation wall with staggered plastic/fibreglass insulation fasteners over damproofing membrane.
- .2 Provide standard extruded polystyrene insulation below grade and cement faced extruded polystyrene insulation with caulked joints extending down minimum 600 mm below finished grade. Caulking of cement faced extruded polystyrene insulation to be grey to match concrete face colour.
- .3 Protect entire face of extruded polystyrene insulation exposed to backfill (below grade) with drainage board in accordance with Section 33 46 13.

.5 Expanded polystyrene insulation (EPS) - under slab:
- .1 Install expanded polystyrene insulation in accordance with manufacturer's written instructions.
- .2 Provide insulation with tight butt joints. Stagger end joints.

.6 High density extruded polystyrene insulation (XPS) - footings, columns and structural mat foundations:
- .1 Install high density extruded polystyrene insulation in accordance with manufacturer's written instructions.
- .2 Provide insulation with tight butt joints. Stagger end joints.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for sprayed foam insulation work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.2 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.3 ASTM D1621, Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.

.4 ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

.5 ASTM D1623, Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.

.6 ASTM D2126, Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

.7 ASTM D2842, Standard Test Method for Water Absorption of Rigid Cellular Plastics.

.8 ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.

.9 ASTM E2178, Standard Test Method for Air Permeance of Building Materials.

.10 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

.11 CAN/ULC S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.

.12 CAN/ULC S705.2, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

.13 CAN/ULC S770, Standard Test Method for Determination of Long-term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

.14 CAN/ULC S774, Standard Laboratory Guide for the Determination of Volatile Organic Compound Emissions from Polyurethane Foam.

.15 ISO/IEC 17024, Conformity Assessment. General Requirements for Bodies Operating Certification of Persons.

1.3 SUBMITTALS

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
  - .1 Elevations, sections, materials, details of joint conditions, including door, window, entrance framing, flashings, and roof parapet connection.

.3 Samples: Submit following samples in accordance with Section 01 33 00:
- .1 Two 150 x 150 x 75 mm thick samples of sprayed insulation.

.4 Certificates/reports: Submit the following certificates and reports in accordance with Section 01 33 00:
- .1 Applicator’s current certificate of approval by CUFCA/NECA training program or ISO/IEC 17024 certification organization recognized by CCMC.
- .2 Applicator’s current certificate of approval from material manufacturer.
- .3 Submit test reports to CAN/ULC S102 for surface burning characteristics.

1.4 QUALITY ASSURANCE

.1 Perform work of this Section by a company that has a minimum of five years proven experience in installations of similar size and nature and that is approved by the manufacturer.

.2 Contractor to be a certified member of the Canadian Urethane Foam Contractors Association/ National Energy Conservation Association (CUFCA/NECA) or licensed by ISO/IEC 17024 certification organization recognized by CCMC and in accordance with CAN/ULC S705.2 installation standard.

.3 Provide quality assurance testing in accordance with CAN/ULC S705.2. Record daily results in a log book for Consultant’s review.

.4 Provide adhesion tests on transition membranes, in accordance with manufacturer’s written instructions, at the perimeters of all openings. If the project comprises more than 10 openings, adhesion tests should be conducted on 15% of them. For jobs comprising 10 or fewer openings, 30% of these should undergo adhesion tests. Adhesion tests should be performed on the transition membranes at every tenth column or beam.

.5 Mock-up:
- .1 Construct mock-up of 2 m^2 minimum, of spray-in-place foam insulation to thickness as indicated on drawings, including one inside corner and one outside corner.
- .2 Arrange for Consultant's review and acceptance, allow 24 hours before proceeding with work.

.3 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

.6 Pre-installation meeting: Arrange with manufacturer's representative, Contractor, and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.5 **DELIVERY, STORAGE AND HANDLING**

.1 Deliver foamed-in-place polyurethane insulation materials and components in manufacturer's original packaging with identification labels intact and in sizes to suit Project.

.2 Store materials off ground and protected from exposure to harmful weather conditions and at temperatures between 23 and 30 ºC.

1.6 **SITE CONDITIONS**

.1 Do not install work of this Section outside of manufacturer recommended environmental ranges without Consultant's and Product manufacturer's written acceptance.

.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 48 hours before, during, and 48 hours after installation.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Sprayed foam insulation: 2 component sprayed-applied medium density closed cell polyurethane foam insulation conforming to CAN/ULC S705.1., with Global Warming Potential (GWP) of 1 and containing no fluorocarbons and conforming to the following minimum requirements:

.1 Thermal resistance:
  .1 Long term to CAN/ULC S770, 2.1 RSI at 50 mm thickness.
  .2 Aged to ASTM C518, 2.45 RSI at 90 days.
.2 Density to ASTM D1622, 30 kg/m3.
.3 Vapour permeability to ASTM E96, 47.34 ng/Pa.s.m2 at 25 mm thickness.
.4 Water absorption to D2842, 0.5 % volume.
.5 Air permeability to ASTM E2178, 0.0002 L/s m2 at 75 Pa.
.6 Surface burning characteristics to CAN/ULC S102:
  .1 Flame spread: 5.
  .2 Smoke developed: 130.
.7 Hot surface performance to ASTM C411, 90 ºC.

.8 Dimensional stability to ASTM D2126:
.1 Volume change after 7 days: 5 % at 70 ºC and 97 % RH.
.2 Volume change after 28 days: -9.6 % at 70 ºC and 97 % RH.
.9 Compressive dtrength to ASTM D1621, 180 kPa minimum.
.10 Tensile strength to ASTM D1623, 226 kPa minimum.
.11 VOC emissions: Pass to CAN/ULC S774.
.12 Sprayed urethane foam: 'Insulthane Extreme' by Elastochem Specialty Chemicals Inc. or approved alternative by BASF or approved alternative manufacturer.
.13 Provide sprayed foam insulation in difficult to reach spots such as behind beams or columns or where a higher thermal rating is required and sprayed foam insulation is employed to meet the intended thermal value.

.3 Primers and sealants: As recommended by sprayed foam insulation manufacturer.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance. Obtain manufacturer's approval of substrate in writing, submit copy to Consultant.

.3 Ensure that substrate temperatures are within manufacturer's parameters for product being applied.

.4 Ensure that there is no surface spalling.

.5 Ensure sealants completely fill gaps in substrate and at joints.

3.2 **PREPARATION**

.1 Provide ventilation in area to receive sprayed foam insulation, introducing and exhausting fresh air continuously during and for 24 hours after application.

.2 Provide temporary enclosures to prevent spray from contaminating air beyond application area, and damage from overspray and dusting on adjacent surfaces.

.3 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from work of this Section.

.4 If required, apply primer to substrate surfaces in accordance with manufacturer's written instructions.

.5 Fill open joints and voids in concrete greater 25 mm.

3.3 **SPRAY INSULATION**

.1 Apply insulation in accordance with manufacturer's written instructions and conforming to CAN/ULC S705.2.

.2 Apply sprayed foam insulation to thickness indicated on drawings and to provide continuous air retarder in locations indicated on the Drawings.

.3 Use only high pressure sprayers to apply foamed-in-place insulation
.1 Apply evenly in 15 mm to 50 mm thick increments, with a minimum wait time between passes as recommended by manufacturer.

.4 Provide one measuring pin for every 50 m^2.

.5 Insulation to be continuous, level, plumb and uniform thickness as indicated throughout. Insulation shall be free of voids and imbedded foreign materials.

3.4 **INSPECTION AND TESTING**

.1 Arrange for third party site-inspection by approved company. Cost of inspections shall be included in bid price.

.2 Site inspection shall be carried out at 5%, 50% and 95% completion to verify conformance with CAN/ULC S705.2, manufacturers written instructions and this Section.

.3 Written inspection reports shall be forwarded to Consultant within three (3) working days of test being performed.

3.5 **CLEANING**

.1 Leave work area clean at end of each day.

.2 Upon completion, remove surplus materials, rubbish, tools, and equipment.

3.6 **PROTECTION**

.1 Protect applied materials from damage during construction.

.2 Repair damage to foamed-in-place polyurethane insulation caused by ongoing construction.

.3 Repair damage to adjacent materials caused by foamed-in-place polyurethane insulation application.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for under slab vapour retarder work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM E1643, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

.2 ASTM E1745, Standard Specification for Water Vapour Retarders used in contact with Soil or Granular Fill under Concrete Slabs.

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.
  - .3 Details at all expected terminations, transitions and similar areas.

.2 Samples: Submit following samples in accordance with Section 01 33 00:
- .1 Two 300 x 300 mm samples of vapour retarder.
- .2 Duplicate samples of pipe and conduit boot.

1.4 **QUALITY ASSURANCE**

.1 Pre-Installation Meeting: Arrange meeting on Site to be attended by Consultant, Contractor, and vapour retarder manufacturer’s representative to review installation procedures, interfaces with adjacent work, conditions under which work will be performed, inspect the surfaces to receive the vapour retarder, and installation procedures 48 hours in advance of installation.

1.5 **SITE CONDITIONS**

.1 Do not install the work of this Section outside of environmental ranges as recommended by manufacturer without Consultant's and Product manufacturer's written acceptance.

.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements before, during, and after installation.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Vapour retarder (under slab): ASTM E1745, Class A, 0.38 mm (15 mil) thick; 'Stego Wrap Vapor Barrier' by Stego Industries or 'Perminator' by W.R. Meadows.

.1 Joint sealing tape: High quality and high density tape with pressure sensitive adhesive with minimum width 100 mm. Type recommended by under slab vapour retarder manufacturer. Duct tape will not be permitted for use.

.2 Pipe and conduit boots: Construct pipe and conduit boots from vapour retarder material and pressure sensitive tape as recommended by manufacturer.

3 Execution

3.1 **EXAMINATION AND COORDINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Coordinate installation of vapour retarders with work of other Sections to achieve a vapour tight building envelope.

3.2 **UNDER SLAB VAPOUR RETARDER INSTALLATION**

.1 Install sheet vapour retarder under the floor slab prior to installation of floor slab, to form a continuous vapour retarder in accordance with ASTM E1643 and manufacturer's written instructions.

.2 Lap vapour barrier over footings and seal to foundation walls.

.3 Overlap joints 150 mm and seal with manufacturer and Consultant approved sealing tape.

.4 Seal all penetrations (including conduits and pipes) with manufacturer's pipe boot or accessories in accordance with manufacturer's recommendations and details. Sealing tape and penetration boot work to be inspected by third party inspection and testing agent prior to concealment.

.5 Use sheets of largest practical size to minimize joints.

.6 Inspect for continuity. Repair punctures and tears with high quality sealing tape before work is concealed.

.7 Ensure continuity of vapour retarder is maintained at junctures with other materials and within sheets of under slab vapour retarder using sealing tape.

3.3 **FIELD QUALITY CONTROL**

.1 Inspect vapour retarder continuity immediately prior to installation of subsequent construction. Repair punctures, rips and tears to ensure continuity of vapour retarder.

.2 Where punctures and tears are extensive, replace entire damaged section.

.3 Do not cover or permit to be covered any portion of vapour retarder until it has been inspected by Consultant.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Interior air and vapor control layer, including surface preparation.

1.2 REFERENCES

.1 AATCC 127, Hydrostatic pressure test.

.2 ASTM E84, Standard test method for surface burning characteristics of of building materials.

.3 ASTM E779, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.

.4 ASTM E2178, Standard Test method for. Air Permeance of Building Materials.

.5 EN 1296, Flexible sheets for waterproofing - Method for artificial ageing by long term exposure to elevated temperature.

.6 EN 1849-2, Flexible sheets for waterproofing - Determination of thickness and mass per unit area.

.7 EN 1931, Determination of water vapor transmission properties.

.8 EN 12114, Thermal performance of buildings - Air permeability of building components and building elements.

.9 EN 12310-1, Flexible sheets for waterproofing. Determination of resistance to tearing (nail shank).

.10 EN 12311-2, Flexible sheets for waterproofing. Determination of tensile properties.

.11 EN 13859-1, Flexible sheets for waterproofing - Underlays for discontinuous roofing/(sheathing).

.12 ISO 9972/ EN 13829, Determination of air permeability of buildings, Fan pressurization method.

.13 ISO 12572, Hygrothermal performance of building materials and products.

1.3 SUBMITTALS

.1 Submit under provisions of Section 01 33 00.

.2 Product Data: Manufacturer's data sheets on each product to be used, including:
1. Installation instructions and recommendations.
2. Storage and handling requirements and recommendations.

.3 Verification Samples: For each product specified, two samples.
1. Membranes: minimum size 6”x8”
2. Tapes: minimum length 5”
3. Gaskets, adhesives, accessories: one each

1.4 QUALITY ASSURANCE

.1 Air and Vapour Control Layer Master: Assign a person in the team (within the contracting company or hired) to be in charge of the air control layer continuity throughout the building. This person will coordinate the sub-trades erecting the assemblies and ensure that the transitions are properly taped and seal. The Air and Vapour Control Layer master has to be able to execute, repair, tape and seal the Air and Vapour Control layer.

.2 Installer Qualifications: The Air Control Layer Master has completed air tightness training (475's "Make it tight", SIGAS'S Training, Cosella Dorken's DELTA® Academy, or equivalent).

.3 Continuity of the Air Control layer: Complete Seal:

- Transitions between different components of the Air Control Layer have to be sealed with high-quality tape to provide a continuous Air Control Layer.
- Curtain Wall to wall: double sided tape if needed. Concealed tape behind perimeter rigid insulation.
- Wall to the soffit.
- Wall above grade to wall below grade: EPDM Gasket and Tape with primer on concrete.
- Penetrations: Gasket and tape.
- Around beams: ¾" plywood taped with tape or similar, rubber roller pressed.

.4 Mock-Up: Provide a mock-up for evaluation of installation techniques and application workmanship.

.1 Prior to installation of the airtight layer, mock-up airtight layer as follows to verify details and to demonstrate connections to adjoining construction elements, and other termination conditions.

.2 Install mockup of the airtight layer in a location designated by Architect.

.3 Do not proceed with remaining work until workmanship and application technique are approved by Consultant.

.4 Construct typical interior wall, 8 feet wide by 8 feet long, illustrating materials interface and connections (tape, adhesives, gaskets), incorporating specified options including but not limited to the following:

.1 junctions of walls, foundations, ceilings, floors and roof,

.2 corner conditions

.3 window and doorframe connections, and

.4 blow-in insulation seals/battens.

.5 Whole Building Air Tightness Test:

.1 Cooperate and coordinate with the owner's inspection and (blower door/smoke) testing agency. Do not cover (with sheetrock, blocking, mechanical equipment or other elements that would restrict access to the airtight membrane) any components of the mock-up (installed airtight layer membrane or other airtight elements) until it has been inspected, blower door/smoke tested and approved. Consultants should be attending to all tests.

.2 Minimum of two blower door tests with smoking pencil and thermographic camera to identify leaks. One before drywall and another one after. Mark leaks with a visible sign and remediate as required. Each test should be followed by a report showing the Air Changes per Hour and/or Litres per second of exterior envelope (l/s/m2) at 75Pa.

.3 Additional blower door/smoke tests might be required to verify the remediated work.

1.5 MOCK-UP AIR TIGHTNESS TESTING

.1 Complete walls, roof, glazing and all components of the air barrier system in the mock-up area in advance of other work.

.2 Document the construction of the air barrier system and related building enclosure components as directed in the air barrier commissioning meeting.

.3 Construct temporary air-tight wall to isolate mock-up area as indicated.
- .1 Frame temporary air-tight wall using wood studs and drywall.
- .2 Make airtight using contractors tape (e.g tuck tape) and seal perimeter to building floor, walls, and ceiling. Seal around building joists, pipes, and other obstacles as directed by air barrier commissioning agent.
- .3 Provide one person door (minimum 30 in. wide) for access to the mock-up area.

.4 The Air and Vapour Control Layer Master will assist the air barrier commissioning agent setting up and the final temporary air sealing on the day of the mock-up air tightness testing.

.5 Review test report, photos and leakage path demonstration videos with all building envelope trades.

1.6 **PRECONSTRUCTION MEETING**

.1 Preconstruction Meeting: Convene a meeting with the Air and Vapour Control Layer Master and all subcontractors affected by the Work of this Section a minimum of one week prior to commencing work of this section. Agenda shall include materials, details of construction, compatibility of materials, sequencing of construction/installation of membranes, the airtightness goal and emphasize that the success during the blower door test is dependent on the collaboration of all subcontractors.

.2 Coordinate Work with other subcontractors (plumbers, electricians, carpenters, HVAC), operations and installation of finish materials to install correct-sized gaskets on pipes, ducts, and cable when these elements pass through the interior airtight layer, and to avoid damage to installed materials. Before they commence work on site, provide each affected trade with sufficient gaskets.

.3 After meeting, post the following warning in a prominent location at all building entrances and top of each stair – 4” letter height minimum for the header, 2” for all other text

AIRTIGHT BUILDING

No drilling or cutting on exterior walls, roof, and slab without authorization.

Report all penetrations to the supervisor or person in charge of the Air and Vapour Control layer

.4 Translate into additional languages if required/as appropriate.

1.7 **DELIVERY, STORAGE, AND HANDLING**

.1 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

.2 Store materials on pallets. in clean and dry areas, not exposed to direct sunlight and in accordance with manufacturer's instructions. Store adhesives and primers at temperatures at or above 40 degrees Fahrenheit (4 degrees Celsius) to facilitate handling.

.3 Protect materials during handling and application to prevent damage, puncturing or contamination.

1.8 **ENVIRONMENTAL CONDITIONS**

.1 Maintain environmental conditions (temperature, humidity, and ventilation) as per manufacturers recommendations. Do not install products under environmental conditions outside the manufacturer's absolute limits.

.2 Minimize exposure of airtight membranes to direct sunlight. Use blinds or covers over window openings to block direct sunlight to prevent UV damage to membranes, if membranes will not be covered by sheetrock within 2 weeks or use exterior grade products.

.3 Minimize exposure to water. If exposure is likely, expected or cannot be avoided, use exterior grade products.

PART 2 PRODUCTS

2.1 **MANUFACTURERS**

.1 Sheets: Proclima: Intello Plus – High Performance Smart Vapour Retarder and air barrier. SIGA: Majrex Hygrobrid – Moisture variable vapour control layer.

.2 Tapes for interior use – Vapour impermeable: SIGA's Rissan 60-100-160. PROCLIMA'S TESCON VANA – SL. Artificial age test: 40 years.

.3 Tapes for the interior of windows – pre-folded and release split for precise pre-set: PROCLIMA's Tescon Profil. SIGA's Fentrim.

.3 Tapes for exterior use – Vapour permeable: SIGA's Wigluv (must be reinforced with SIGA-Docksin high-performance primer when used in concrete, masonry, plaster or stucco. CONTEGA HF or CONTEGA Classic, CONTEGA MULTIBOND (pre-cure adhesive on a roll): non-embrittling adhesives for membrane connections to concrete, plywood floors and very rough/split wood. Artificial age test: 40 years. Artificial age test: 40 years.

.4 Window flashing tapes: 3M ALL WEATHER FLASHING TAPE 8067. CONTEGA SOLIDO SL(-D): vapor retarding window tape with multiple release papers for specific or blind taped window air sealing. SIGA's Wigluv

2.2 **ACCESSORIES**

.1 PRESSFIX tape pressurization tool.

.2 Primer: TESCON Primer RP (for concrete):
1. Acrylic-copolymer based primer.
2. Application Temperature: Above 15 degrees Fahrenheit (-10 degrees Celsius).
3. VOC free.

.3 Pipe, duct, cable sealing: ROFLEX and KAFLEX gaskets.
1. EPDM gaskets per specific pipe sizes.
2. Tape with TESCON VANA to airtight layer.

.4 Outlet sealing (recessed): INSTAABOX / LESSCO boxes.
1. Self-sealing airtight outlet box.
2. Tape with TESCON VANA to airtight layer.

.5 Metal studs: Fastweb strips or cap screws.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Do not begin installation until substrates/surfaces have been properly prepared and cleaned from dust, silicones, oils, and grease. Before installation, verify substrate is free of splinters, nails or other objects that could puncture membranes.

.2 If the window or door opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

.3 If there are unexpected pipes, ducts or wires in the installation area/airtight layer or these penetrations do not have gaskets around them, notify Architect of unsatisfactory preparation before proceeding.

.4 If floor, walls or ledger boards have been built that interfere with the airtight layer and a drawn/planned pre-installed airtight membrane was not installed as per sequencing plan, notify Architect of unsatisfactory preparation before proceeding.

.5 If long-term exposure to UV or liquid water is likely or can be expected, use membranes that can withstand the expected conditions and that are approved by the consultant.

3.2 PREPARATION

.1 Clean and prepare surfaces to receive air/vapor barrier in accordance with manufacturer's installation guidelines.

.2 All surfaces must be clean, smooth and dry and must be clean of oil, dust, and silicone.

.3 Batt installation: install membrane immediately after batt insulation is installed in winter.

.4 Properly ventilate space or use a dehumidifier to prevent high humidity conditions after concrete pours, sheetrock compounding and tile work. Monitor humidity if needed to ensure it stays below 60% relative humidity.

3.3 APPLICATION

.1 Apply airtight layer/vapor retarder in accordance with manufacturer's written instructions.

.2 Install membranes taut and without creases along the substrate.

.3 Overlap subsequent courses of the membrane. Use the printed lines on the membrane as a guide.

.4 Mechanically fasten as per installation manuals

.5 Battens for service cavities for dense packing should be spaced less than 20” o.c. and be perpendicular to the direction of the structure behind. Or other means should be employed to mechanically fix the membrane sufficiently to the substructure to long-term support the weight/force exerted by the insulation – please contact a technical representative for additional means and methods.

.6 Tape all overlaps. Use a tape pressurization tool to ensure there is sufficient back-pressure when applying the pressure sensitive tapes. Make sure that tape joints are not permanently under stress, ie are supported by a batten or by cross taping the taped joint with 12” long pieces of tape every 12”

.7 Overlap the membrane a minimum of 2” over dissimilar airtight materials (concrete, plaster).

.8 Use specific tapes and primer to adhere membranes to concrete, brick, plaster or rough OSB. Leave some slack in the membrane to allow for expansion and contraction between these dissimilar materials. Prime substrates if necessary.

.9 If taping to the membrane to porous or unknown substrates, they should be free of oil, silicone, and dust. Do an adhesion test when in doubt. Primer recommended for application to brick, concrete, wood fiber insulation board and certain OSB brands.

.10 Cut membrane with a utility knife in detail around penetrations.

.11 Seal membranes to windows, joist, and beams with airtight window tapes. Follow application guides of specific tapes.

.12 Seal all penetrations with gaskets taped with airtight tape to airtight layer. Air seal around pre-existing penetrations (pipes, ducts or cables) in a step-like fashion, avoiding creases in tape.

.13 Apply blown in insulation directly after installing interior airtight membranes.

.14 Inspect membrane before blower door test and/or dense-packing insulation. Ensure:
- .1 each overlap is taped and has been pressurized.
- .2 staples applied at appropriate intervals.
- .3 counter battens at recommended distances.
- .4 tears and punctures repaired with tape.
- .5 adhesives have had 48 hours to set up before the test.

3.4 TESTING

.1 Do a blower door test as soon as the airtight layer is completely installed. During the test search for any detectable leaks with hands, IR, fog machine and/or smoke pencils.

.2 Document any leaks, and repair with specified tapes, adhesives, and accessories.

3.5 PROTECTION

.1 Protect installed products until completion of the project.

.2 Repair tears, punctures or burns (e.g. from sweating copper pipe) and/or replace damaged products before covering materials. Re-do blower door test if more than 3 holes are made or by request of Consultant.

.3 To protect interior airtight layer/membranes, apply service cavity insulation and sheetrock as soon as possible, and not later than specified exposure limit of used materials. Use tarps or other means of blocking UV if exposure times will be exceeded to protect membranes.

3.6 **FINAL TEST**

.1 Final blower door/smoke test shall be conducted by the Envelope Commissioning Agent on the installed membrane/interior airtight layer when:
  .1 All penetrations have been made and sealed.
  .2 Sheetrock and other finishes on exterior walls have been installed.

.2 This final test shall confirm that no new openings have been introduced since the definitive air tightness testing.

.3 Contractor shall cooperate and be present with the Envelope Commissioning Agent for the duration of the final blower door/smoke testing and be responsible for addressing deficiencies identified and repairing them at no additional cost to the Owner.

.4 The Envelope Commissioning Agent shall repeat testing until the project complies with the project goals. The Contractor shall perform repairs as required to be compliant with project goals and meet the satisfaction of the Envelope Commissioning Agent and the Consultant. All repair work resulting from repeated testing shall be at no additional cost to the Owner.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, tools, equipment and services necessary for exterior soffit system work (SF2) complete in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ANSI B18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

.2 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

.3 ASTM C920, Specification for Elastomeric Joint Sealants.

.4 CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

.5 CSA S136, Cold Formed Steel Structural Members.

1.3 **DESIGN REQUIREMENTS**

.1 Design soffit system to accommodate expansion and contraction of soffit elements without causing buckling, failure of joints, undue stress on fasteners or other effects detrimental to appearance or performance and to permit free vertical movement of adjacent curtain wall system.

.2 Design exterior soffit system to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

.3 Design exterior soffit system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design soffit system to prevent vibration when subject to the effects of wind.

.4 Design miscellaneous structural framing members as required to complete exterior soffit system, where not indicated on Contract Drawings.

1.4 **SUBMITTALS**

.1 Product data:
  .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
    .1 Performance criteria, compliance with appropriate reference standard, characteristics, and system limitations.
    .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 indicating:
.1 Details, sections, dimensions, tolerances, connections, terminations, control joints, system components, installation sequence, accessories and other pertinent information required for proper and complete installation.
.2 Complete design data to confirm that soffit system meet design requirements specified.
.3 Submit plan showing extent of work, venting and control joints.

.3 Samples: Submit two 300 x 300 mm samples of complete soffit system in accordance with Section 01 33 00.

.4 Reports: Submit written inspection reports within 5 working days after each inspection.

.5 Closeout submittals: Submit maintenance and cleaning instructions for soffit system for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.5 QUALITY ASSURANCE

.1 Retain a licensed Professional Engineer, registered in the Province of Ontario, to perform following services for exterior soffit system work:
.1 Design of exterior soffit system.
.2 Review, stamp, and sign shop drawings.
.3 Conduct shop and field inspections and prepare and submit inspection reports.

.2 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience installing work of similar size and nature and that is approved by system manufacturer. Submit to Consultant, applicator’s current certificate of approval by the material manufacturer as proof of compliance.

.3 Soffit system manufacturer shall conduct Site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed shop drawings. Perform inspections once per week minimum.

.4 Mock-up:
.1 Construct one 3000 mm minimum mock-up of soffit system, incorporating soffit vent, in location acceptable to Consultant.
.2 Arrange for Consultant's review and acceptance.
.3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

.5 Pre-installation meeting: Arrange with manufacturer's representative, Stucco Subcontractor, and Consultant to inspect substrates, review installation procedures and site specific details minimum 48 hours in advance of installation.

1.6 **SITE CONDITIONS**

.1 Do not install stucco coating work outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:
.1 Ambient air and surface temperature: 5^0C to 35^0C
.2 Precipitation: None.

.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 24 hours before, during, and 24 hours after installation.

.3 Do not proceed with application of materials immediately prior to, during or immediately after inclement conditions, or if wet weather is anticipated within 24 hours after application. Do not apply materials to wet, frozen, or frosted surfaces.

.4 Protect applied stucco coatings from rapid evaporation during dry and hot weather.

1.7 **EXTENDED WARRANTY**

.1 Submit an extended warranty for soffit system work in accordance with the General Conditions, except that the warranty period is extended to 5 years from date of Substantial Performance of the Work.
.1 Warrant against failure to meet the design criteria and requirements such as failure to stay in place, cracking, warping, and finish degradation.
.2 Coverage: Complete replacement including affected adjacent Work.

2 Products

2.1 **EXTERIOR COMPOSITE METAL SOFFIT ASSEMBLY (SF1)**

.1 Composite metal soffit assembly: In accordance with Section 07 42 40.

2.2 **EXTERIOR CEMENT BOARD SOFFIT ASSEMBLY WITH STUCCO COATING (SF2)**

.1 All materials under work of this Section, including but not limited to, coatings, sealants, primers, and sealers are to have low VOC content limits.

.2 Exterior Cementitious Board: High strength portland cement building panel with self adhesive glass tape, with heavier mesh reinforcement for suspended applications. Durock by CGC Inc. or approved alternative by CertainTeed Gypsum Canada, G-P Products or approved alternative manufacturer.

.3 Exterior Stucco Coatings:
- .1 Primer: Type as recommended by coating manufacturer.
- .2 Reinforcing mesh: balanced, open weave, glass fibre fabric made from twisted multi-end strands, treated, alkali resistant, both standard and high-impact types.
- .3 Base coat: Polymer-based, water resistant cementitious coating system, colour grey, complete with reinforcing mesh. 'Dryflex' by Dryvit or approved alternative by Adex, BASF Wall Systems, DuRock or approved alternative manufacturer.
- .4 Finish coat: 100% acrylic based exterior coating finish, having a smooth texture and in custom colours as selected by Consultant, 'Lymestone' by Dryvit or approved alternative by Adex, BASF Wall Systems, DuRock or approved alternative manufacturer.

.4 Structural shapes, plates, sag rods, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 300W.

.5 Wood blocking and framing: In accordance with Section 06 10 00.

.6 Accessories: Hot-dip galvanized in accordance with ASTM A123, in locations shown on Contract Drawings.

.7 Fasteners: Provide type 304 stainless steel fasteners.

.8 Soffit vents:
- .1 75 mm wide, continuous, extruded aluminum soffit vent, ‘Fry Reglet Soffit Vent, Model PCS-75-V-300’ by Fry Reglet or approved alternative.
- .2 Finish and colour: Factory primer to serve as a base for field painting. Post painted in accordance with Section 09 91 00 to match soffit colour. Factory primer shall be compatible with paint system in Section 09 91 00.

.9 Sealant and sealant primer: ASTM C920, Type S, Grade NS; ‘Dowsil 790' by Dow Consumer Solutions or ‘Spectrem 3' by Tremco Limited complete with primer recommended by manufacturer.

.10 Joint filler: extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 - 200 kPa, outsized 30 to 50%.

2.3 EXTERIOR PERFORATED METAL SOFFIT ASSEMBLY (SF3)

.1 Metal perforated soffit assembly: In accordance with Section 07 46 19.

2.4 MIXES

.1 Measure and batch materials by either volume or weight only, to accurately control and maintain proportions. Mix and prepare materials in accordance with manufacturer's written instructions.

.2 Do not add any additional additives, rapid binders, antifreeze, accelerators, fillers or pigments without the written approval of the manufacturer and Consultant.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **PREPARATION**

.1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, and other foreign matter detrimental to performance. Ensure environmental and site conditions are suitable for installation of system.

.2 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from work of this Section.

.3 Prepare surfaces in accordance with manufacturer's written instructions.

.4 Protect finished work at end of each day or on completion of each section of work from water penetration. Protect completed installation from moisture for 48 hours minimum.

3.3 **EXTERIOR CEMENT BOARD SOFFIT SYSTEM**

.1 Install soffit system in accordance with reviewed shop drawings and manufacturer's written instructions. Comply with system manufacturer’s requirements regarding terminations at end of each days work and resumption of work.

.2 Wood blocking and framing: Install blocking and framing in accordance with Section 06 10 00 and as required to suit exterior soffit system.

.3 Exterior cement board soffit:
- .1 Install exterior cement board sheathing materials in accordance with manufacturer’s written instructions.
- .2 Seal all cut edges, ends, utility holes and fastener heads, as recommended by manufacturer.
- .3 Tape and fill all joints and fastener heads using materials recommended by cement wallboard manufacturer.

.4 Exterior stucco coating:
- .1 Install stucco in accordance with manufacturer's written instructions. Comply with system manufacturer's requirements regarding terminations at end of each days work and resumption of work.
- .2 Apply base coat to a minimum thickness of 2.4 mm continuously over substrate to provide a hydrostatic water resistant coating. Ensure that substrate is properly sealed.
- .3 Immediately place the reinforcing mesh against the wet base coat mixture on the cement board substrate and edge wrap edges of cement board with reinforcing mesh and seal with base coat as required to protect it from water intrusion.
- .4 With curve of mesh against the intended substrate, trowel from center to edges, avoiding wrinkles, until mesh is fully covered and not visible. The overall minimum base coat thickness shall be sufficient to fully embed the reinforcing mesh and seal edges.
- .5 Apply second coat of base coat.
- .6 Allow 24 hours minimum for curing and drying, protect base coat from contamination and other damage detrimental to system appearance and performance.
- .7 Trowel apply and level top coat to a uniform 'tight' thickness. Allow first coat to become dry to touch. Apply a second coat similar to first. Float the finish lightly with a plastic float. After finish has taken up slightly, trowel again with either a stainless steel trowel or plastic float.
- .8 Achieve final colour and texture free from defects detrimental to appearance and performance to match accepted sample.
- .9 Protect finish coat from weather, contaminants, and other damage detrimental to system appearance and performance until cured.

.5 Soffit vents: Install continuous soffit vents in soffits as indicated on drawings to provide ventilation of concealed soffit spaces in accordance with OBC requirements.

.6 Control joints:
- .1 Provide control joints in locations as indicated on drawings or maximum 6 m on centre in each direction.
- .2 Caulk all control joints and joints between stucco and adjacent construction in accordance with manufacturer's written instruction.

3.4 EXTERIOR COMPOSITE METAL SOFFIT ASSEMBLY

.1 Composite metal soffit assembly to be in accordance with Section 07 42 40.

3.5 EXTERIOR PERFORATED METAL SOFFIT ASSEMBLY

.1 Metal perforated soffit assembly to be in accordance with Section 07 46 19.

3.6 CLEANING AND TOUCH-UPS

.1 Clean any spots or blemishes from surface of work and leave system in clean condition. Re-apply stucco finish to damaged surfaces only if approved by Consultant, and to no additional cost to the Owner.

.2 Leave soffit systems clean.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for exterior aluminum composite panel (ACP) and soffit (SF1) work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 AAMA 2605, High Performance Organic Coatings on Architectural Extrusions and Panels.

.2 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

.3 ANSI B18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

.4 ASTM C920, Specification for Elastomeric Joint Sealants.

.5 ASTM D1781, Standard Test Method for Climbing Drum Peel for Adhesives.

.6 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.7 CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

.8 CSA S136, Cold Formed Steel Structural Members.

1.3 **DESIGN REQUIREMENTS**

.1 Design exterior aluminum wall and soffit composite panel systems as a “dry joint system” and to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads, imposed and other loads.

2. Prevent rain penetration through wall system. Incorporate means of draining to the exterior.

3. Design exterior metal wall panel system to support its own weight and the wind load, positive and negative, prevalent for the location of the building, but no less than windgust pressure calculated from National Building Code using 1-10 year probability factor. To minimize the potential for “dished” panels after loading, permanent set of the panel, measured normal to the panel surface after application and removal of the design load, must not exceeding L/800 of distance between supported edges of panel or distance between stiffeners where stiffeners are used. Stiffeners, where used, must not deflect more than L/90 of span under load.

4. Design exterior metal wall and soffit panel system to accommodate thermal movements of the components and structural movements to provide an installation free of oil canning, buckling, delamination, failure of joint seals, excessive stress on fasteners or any other detrimental effects.

.5 Design 50 mm depth of composite panel system to include sufficient reinforcing to accommodate use in playground area.

.6 Design composite panel system to prevent rattling and vibration of panels, overstressing of fasteners and clips, and other detrimental effects on the system.

7. Panel removal: System design to allow removal of individual panels within wall system.

.8 Design miscellaneous, additional structural framing members as required to complete composite panel system, where not indicated on Contract Drawings.

.9 The attachment face of subgirts supporting the panel system must not deflect vertically more than 3 mm due to the dead load of the panel system.

1.4 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
  - .1 Elevations, details, profiles, dimensions, thickness of materials, finishes, methods of joining, joint location, special shapes, methods of anchoring, anchor and clip details, types of sealants and gaskets, waterproof connections to adjoining work, additional reinforcing in panel to accommodate use in playground, details of other pertinent components of the work (i.e. windows, penetrations, membranes, etc), and compliance with design criteria and requirements of related work.
  - .2 Complete design data to confirm that wall and soffit system meet design requirements specified.

.3 Samples:
- .1 Submit two 300 x 300 mm samples of wall and soffit panels with sample typical joints in the selected colours and finish for Consultant’s approval.
- .2 Submit two 300 mm long samples of soffit vent to demonstrate colour match with metal soffit, profile and appearance for Consultant’s approval.

.4 Reports: Submit written inspection reports within 5 working days after each inspection.

5. Closeout Submittals: Provide maintenance instructions for incorporation into Operation and Maintenance Manual, specified in Section 01 78 23.

1.5 QUALITY ASSURANCE

.1 Retain a licensed Professional Engineer, registered in Province of Ontario, to perform following services for composite panel work:
- .1 Design of composite metal wall and soffit panel systems and fully engineered system of anchorage for all work of this Section using the specified thermal spacer clip and girt support system.
- .2 Review, stamp, and sign shop drawings.
- .3 Conduct shop and field inspections and prepare and submit inspection reports.

.2 Perform work of this Section only by a Subcontractor of recognized standing 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 ten years.

.3 Execute steel welding to CSA W59-M by fabricators certified by the Canadian Welding Bureau to CSA W47.1.

.4 Execute aluminum welding by fabricators certified by the Canadian Welding Bureau to CSA W47.2-M.

.5 Execute finishing coatings and metal pre-treatments by applicators approved in writing by the manufacturer of the coatings and under the supervision of the manufacturer's qualified representative.

.6 Mock-up:
- .1 Fabricate, deliver, and erect a 3 m^2 mock-up panel of composite panel system in location acceptable to Consultant.
- .2 Demonstrate full panel fabrication and installation techniques, confirm stiffness/absence of deformation and additional reinforcing to accommodate playground use, finish, anchoring devices, air barrier/vapour retarder sealing, joint detailing and sealing, soffit vent and quality of workmanship.
- .3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

.7 Pre-Installation Meeting: Arrange meeting on Site to be attended by Consultant, Contractor, and panel manufacturer’s representative to review installation procedures, interfaces with adjacent work, conditions under which work will be performed, inspect the surfaces to receive the vapour retarder, and installation procedures 48 hours in advance of installation.

1.6 **DELIVERY, STORAGE, AND HANDLING**

.1 Handle aluminum work in accordance with AAMA CW-10. Protect aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

.2 Remove and replace all damaged and unsatisfactory materials which are deemed unsuitable for use at this Section's own expense.

1.7 **EXTENDED WARRANTY**

.1 Submit an extended warranty for composite panel work in accordance with General Conditions, except that warranty period is extended to 3 years from date of Substantial Performance of the Work.
.1 Warrant against leaking, warping, twisting, joint, and finish failure.
.2 Coverage: Complete replacement including affected adjacent parts.

2. Manufacturer's Warranty: Provide panel manufacturer's written warranty naming Owner as beneficiary and covering failure of factory-applied exterior finish on composite metal panels within the warranty period; warrant finish per ASTM D 4214 for chalk not in excess of 8 NBS units and fade not in excess of 5 NBS units. Warranty period for finish: 10 years from date Work is certified as substantially performed.

2 Products

2.1 **ACCEPTABLE PRODUCTS AND MANUFACTURERS**

.1 Heavy duty aluminum composite panel (Type 1 - full and partial panels at grade and playground areas to approximately 3 m above finished grade or as shown on Contract Drawings):
.1 ‘Alpolic HD - Heavy Duty Aluminum Composite Panels' by Alpolic (Exterior Technologies Group).
.2 Or approved alternatives by Northern Facades, Vicwest Canada or approved alternative manufacturer.

.2 Standard duty aluminum composite panel (Type 2 - full and partial panels higher than 3 m above finish grade or as shown on Contract Drawings):
.1 ‘Accumet 2000' by Northern Facades.
.2 Or approved alternatives by Exterior Technologies Group, Vicwest Canada or approved alternative manufacturer.

2.2 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, sealants, paints, and coatings are to have low VOC content limits.

.2 Heavy duty aluminum composite material (ACP, Type 1 - full and partial panels at grade and playground areas to 3 m above finished grade):
- .1 Two sheets of 0.81 mm thick aluminum alloy 3003, sandwiching a core of extruded thermoplastic polyethylene formed in a continuous process without the use of glues or adhesives between dissimilar materials.
- .2 Panel thickness: 4 mm.
- .3 Bond integrity testing to adhere to ASTM D1781.

.3 Standard duty aluminum composite material (ACP, Type 2 - full and partial panels higher than 3 m above finish grade):
- .1 Two sheets of 0.51 mm thick aluminum alloy 3003, sandwiching a core of extruded thermoplastic formed in a continuous process without the use of glues or adhesives between dissimilar materials.
- .2 Panel thickness: 4 mm.
- .3 Bond integrity testing to adhere to ASTM D1781.

.4 Finishes and colours:
- .1 Exposed to view:
  - .1 PPG Duranar XL, 3 coat, coil coated fluoropolymer thermal setting enamel containing Kynar 500 resin, meeting requirements of AAMA 2605, minimum thickness 2.4 mil.
  - .2 Colours:
    - .1 ACP1: To match Benjamin Moore colour ‘Eccentric Lime (2027-30)’.
    - .2 ACP2: To match Benjamin Moore colour ‘Aruba Blue (2048-30)’.
    - .3 ACP3: To match PPG colour ‘Silver UC 82989XL’.
- .2 Concealed aluminum finish: Mill finish.

.5 Structural shapes, plates, sag rods, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 350W. Provide all additional structural supports not shown on Drawings as required.

.6 Thermal spacer clip and girt support system:
- .1 Provide all components and accessories as required for complete and secure installation of thermal spacer clip and girt support system.
- .2 Z-girts: CAN/CSA S136-M; Minimum 1.2 mm thick, Z275 galvanized, unless otherwise indicated or recommended by manufacturer. Spacing and sizing as engineered to suit intended application.
- .3 Thermal spacer clip:
  - .1 Fibreglass thermal spacer clips fabricated from 100% pultruded glass fibre and thermoset polyester resin sub-framing thermal spacer, minimum 4.8 mm thick in depth as designed for wall system., ‘Cascadia Clip’ by Cascadia Windows and Doors.
  - .2 Specified manufacturer's products establish the minimum acceptable standards for the work of this Section. Approved thermal clip systems consisting of similar thermal performance will be considered provided they are deemed to be consistent with the system indicated and components specified herein.

.4 Fasteners: Corrosion resistant stainless steel fasteners, type as recommended by thermal clip system manufacturer.

.7 Semi-rigid insulation: In accordance with Section 07 21 00.

.8 Breathable moisture barrier:
.1 Self-adhering, tear-resistant, breathable moisture barrier with non-woven polypropylene (PP) fabric, UV stable acrylic coating and adhesive coating on the back, Class A rating in accordance with ASTM E84, in black colour; 'Delta Fassade SA' by Dorken or approved alternative by SRP Canada Inc. or approved alternative manufacturer.
.2 Barrier to be complete with accessories as recommended by manufacturer for intended application and required for complete installation.

.9 Air and vapour control layer: In accordance with Section 07 27 01.

.10 Sprayed insulation: In accordance with Section 07 21 19.

.11 Fasteners: Concealed, ANSI B18.6.4, stainless steel Type 304.

.12 Flashings, Closure Pieces, Trim: Same material and colour as panels.

.13 Clips and Panel Reinforcement: Extruded aluminum.

.14 Soffit vents: 75 mm wide, continuous, extruded aluminum soffit vent with prepainted finish in colour to match metal soffit, profile and appearance to be similar to 'Fry Reglet Soffit Vent, Model PCS-75-V-300' by Fry Reglet.

.15 Sealant: ASTM C920, Type S, Grade NS, Class 100/50; One-part, low-modulus, moisture-curing, silicone. 'Dowsil 790' by Dow Consumer Solutions or 'Spectrem 1' by Tremco. Colour as selected by Consultant. Primer as recommended by manufacturer.

.16 Joint backing: Product as recommended by siding sealant manufacturer.

.17 Touch-up paint: as recommended by panel manufacturer.

.18 Isolation coating: Bituminous coating, acid and alkali resistant material.

.19 Plywood sheathing: In accordance with Section 06 10 00.

2.3 FABRICATION

1. Fabricate aluminum composite wall and soffit panels in accordance with reviewed shop drawings and manufacturer's written instructions.

2. Fabricate facings and concealed support members in a manner which will provide an installation free of exposed fastenings, with sufficient support and allowance for thermal movement to prevent facing distortion. Take site measurements before proceeding with production.

.3 Fabricate components of the system at factory, ready for field installation. Include full continuous joint reveals within system.

4. Fabricate facings flat, true, free of marks, without visible distortion and with edges straight and true. Make all planes true, and corners square and bend of minimum radius.

.5 Changes of plans, parallel or transverse to longitudinal axis shall be accomplished as detailed on shop drawings in the factory wherever practical and with a minimum of field fabrication.

.6 Form panels to dimensions indicated with tolerances to accommodate expansion and contraction between panels and structure members. Accurately form shaped panels.

7. Provide proprietary aluminum extrusions to manufacturer's standard profiles for a complete installation. Extrusions shall be full length around panel perimeter for panel reinforcement and alignment. Intermittent clips are unacceptable.

.8 Fabricate panels with flanges on all sides.

.9 Factory fabricate accessory and trim components ready for installation.

10. Joint filler strip shall be same material and colour as panels. Use of caulking at joints is not acceptable.

11. Plastic shims shall be used as thermal separator between extrusions and sub-girts.

12. Maximum allowable tolerances shall be as follows:
    - .1 Panel bow: In a concave or convex direction to be 0.5% of panel dimension width and length.
    - .2 Panel flatness: Rises and falls across the panel, (local bumps and depressions) will not be accepted.
    - .3 Panel tolerance:
        - .1 Width: 2 mm.
        - .2 Length: 4 mm.
        - .3 Thickness: 0.2 mm.
        - .4 Squareness: 5 mm maximum.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

2. Verify that backup construction is aligned for proper installation of wall panels before commencing erection.

.3 Protect metal surfaces in contact with concrete, masonry mortar, plaster or other cementitious surface with isolation coating.

3.2 **INSTALLATION**

.1 Supply and install miscellaneous, additional structural framing members, required to complete aluminum composite panel system, where not indicated on Contract Drawings.

.2 Supply and install wood sheathing in accordance with Section 06 10 00 and air and vapour control layer in accordance with Section 07 27 01.

3. Erect composite panels complete with strapping/furring, girts, clips, and fasteners, to meet design criteria. Anchor each individual panel over solid backing. Ensure that all penetrations through air/vapour barrier are sealed.

.4 Install aluminum composite panels, support and anchoring system, fasteners, trim and related items to lines and elevations indicated and in strict accordance with reviewed shop/erection drawings and manufacturer's printed instructions. Carefully co-ordinate work with other Sections.

5. Erect aluminum composite panel system in accordance with manufacturer's instructions and under direct supervision of the manufacturer.

6. Install specified heavy duty aluminum composite full and partial panels at grade and playground areas to minimum 3 m above finished grade for added abuse resistance.

7. Install specified standard duty aluminum composite full and partial panels higher than 3 m above finished grade.

.8 Thermal spacer, girt supports and insulation:
- .1 Install thermal spacer, girt support system and insulation in accordance with reviewed shop drawings and manufacturer’s written instructions.
- .2 Confirm thermal clip accommodates orientation of vertical and horizontal sub-framing.
- .3 Clip thermal spacer to Z-girt and fasten clip and girt to back-up structure, fastening through thermal spacer clip and into structure.
- .4 Position Z-girts directly over thermal spacer before installation of fasteners.
- .5 Completely install spacers, screws and sub-framing, prior to installing insulation.
- .6 Install insulation in continuous contact with air and vapour control layer and neatly fitted between girts, supports, and anchoring system.
- .7 Notch semi-rigid insulation at location of thermal spacer clip to match top and bottom of clip.
- .8 Push insulation into place, compressing it at clip location. Ensure there are no linear gaps in adjacent insulation boards on either side of clip.
- .9 Install insulation with insulation fasteners or impaling pins in accordance with manufacturer's written instructions.

.9 Breathable moisture barrier:
- .1 Install moisture barrier in accordance with manufacturer's written instructions with manufacturer recommended seams and joints.
- .2 Remove release liner from back of membrane and press firmly onto substrate. Roll moisture barrier for continuous adhesion over entire substrate area; use manufacturer's recommended hand roller.
- .3 Cut and fit moisture barrier as required for passage of protrusions, ensuring continuous adherence to substrate.
- .4 No penetrations are to be left in installed barrier.

.10 Anchor component parts to transmit wind loading and other stresses to anchorage system.

11. Erect panels and joint filler strip in accordance with manufacturer's details to meet specified design criteria and performance. Use concealed fastening only.

12. Finished work shall be securely anchored, free of distortion, free of surface imperfections and uniform in colour.

13. Cut and flash wall and soffit penetrations.

14. Erect composite panels in straight lines, true, level, and plumb.

15. Site Tolerances: Erection tolerances apply to each individual panel and shall not be accumulative:
- .1 Maximum deviation from vertical and horizontal alignment of erected panels 3 mm in 6 m.
- .2 Maximum offset from alignment between adjacent wall panels: 1.5 mm.

.16 Soffit vents: Install continuous aluminum soffit vents in soffits as indicated on drawings to provide ventilation of concealed soffit spaces in accordance with OBC requirements.

3.3 JOINT BACKING AND SEALANT

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at perimeter of composite panel system and where indicated on drawings for weathertight installation. Tool sealant to concave profile.

.3 Seal around all openings and all other locations indicated or required to provide weathertight and watertight seal.

3.4 REPAIR

1. Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new, unless minor blemishes are approved by Consultant.

2. Only with approval of Consultant, refinish shop applied finishes in field with compatible materials to manufacturer's written instructions.

3.5 **CLEANING**

.1 Remove all strippable protective film from the work as it is erected and prior to moving on to the next bay or grid.

.2 Wash down exposed exterior surfaces using solution of mild non-acidic detergent in warm water, applied with soft clean wiping cloths.

.3 As work progresses, remove excess sealant with recommended solvent and which will not affect metal, finished surfaces, or adjacent surfaces and materials.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for solid and perforated metal wall (MP) and soffit (SF3) siding work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels - Series: Components, Coatings and Finishes.

.2 ANSI B18.6.4, Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.

.3 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

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

.5 ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.6 ASTM C920, Specification for Elastomeric Joint Sealants.

.7 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.8 CAN/CGSB-1.40-M, Primer, Structural Steel, Oil Alkyd Type.

.9 CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

.10 CSA HA-Series-M, CSA Standards for Aluminum and Aluminum Alloys.

.11 CSA S136, Cold Formed Steel Structural Members.

.12 CSA S136.1, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.13 CAN3-S157-M, Strength Design in Aluminum.

1.3 **DESIGN REQUIREMENTS**

.1 Design metal siding and soffit system in accordance with CSA S136, S136.1, and to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

.2 Aluminum wall siding system to be standard building sheet alloy conforming to CSA HA Series -M. General design to be based on CAN3-S157-M.

.3 Design metal siding and soffit system in accordance with following Climatic Design Data for Toronto contained in Ontario Building Code.
.1 Design Temperature: January 1%, July 2 ½%.
.2 Wind (Hourly Wind Pressures): 1 in 50 year occurrence.

.4 Design metal siding system to limit deflection under design loads, to L/240.

.5 Design metal siding and soffit system to prevent restriction of thermal induced movement which would induce deformation such as warping, buckling, and failure of joint seals and fasteners. Design metal siding system to prevent vibration when subject to the effects of wind.

.6 Design miscellaneous, additional structural framing members and blocking, as required to complete metal siding and siding system, where not indicated on Contract Drawings.

1.4 **SUBMITTALS**

.1 Product data:
.1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
.1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
.2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 indicating:
.1 Elevations, details, profiles, dimensions, thickness of materials, finishes, methods of joining, arrangement of sheets, joints, and seams, special shapes, methods of anchoring, anchor and clip details, types of sealants and gaskets, waterproof connections to adjoining work, details of other pertinent components of the work (i.e. windows, penetrations, membranes, etc), and compliance with design criteria and requirements of related work.
.2 Layouts and patterns required for location of exposed fasteners.

.3 Samples:
.1 Submit samples in accordance with Section 01 33 00:
.1 600 x 600 mm samples of solid and perforated siding system showing fully assembled components including face sheets, thermal spacer and sub-girts. Sample to be fabricated using exact colour and gauges specified.
.2 Submit two 300 mm long samples of soffit vent to demonstrate colour match with metal soffit, profile and appearance for Consultant’s approval.

.4 Reports: Submit written field inspection and test report results after each inspection.

1.5 **QUALITY ASSURANCE**

.1 Retain a licensed Professional Engineer, registered in Province of Ontario, to perform following services for metal siding and soffit work:
- .1 Design of solid and perforated metal siding, soffit and fully engineered system of anchorage for all work of this Section using the specified thermal spacer clip and girt support system.
- .2 Review, stamp, and sign shop drawings.
- .3 Conduct shop and field inspections and prepare and submit inspection reports.

.2 Mock-up:
- .1 Fabricate, deliver, and erect one full scale 3 m^2 high mock-up solid and perforated panel of metal siding construction, in location acceptable to Consultant.
- .2 Demonstrate finish, colours, and quality of workmanship.
- .3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

.3 Pre-installation meeting: Arrange with manufacturer's representative, Contractor, and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.6 **DELIVERY, STORAGE, AND HANDLING**

.1 Stockpile panels tilted to provide water run-off, free from ground contact on firm, level, non-staining supports extending full width of sheet and spaced not more than 450 mm apart. Cover components with opaque polyethylene sheet. Vent to allow air movement.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, paints and sealants are to have low VOC content limits.

.2 Solid steel siding (MP-1):
- .1 ASTM A653/A653M, Z275 prefinished solid galvanized steel siding, 0.76 mm minimum base metal thickness.
  - .1 '7/8" Corrugated' by VicWest Steel, nominal 22 mm deep.
  - .2 Or approved alternative by Agway Metals Inc., Roll Form Group or approved alternative manufacturer.

.3 Perforated aluminum siding (MP-2):
- .1 Conforming to CSA HA Series -M, CAN3-S157-M, ANSI H35.1M, and ASTM B209.
- .2 Minimum 3 mm thick, prefinished perforated aluminum siding with 4.8 mm (0.188") round perforations on 16.5 mm (0.65") centres and having 8% open area by Hendrick Manufacturer or approved alternative.

.4 Perforated steel soffit (SF3):
- .1 ASTM A653/A653M, Z275 prefinished perforated galvanized steel soffit, 0.76 mm minimum base metal thickness.
  - .1 'RD 938 Metal Roof Deck - Perforated' by VicWest Steel, nominal 38 mm deep.
  - .2 Or approved alternative by Agway Metals Inc., Roll Form Group or approved alternative manufacturer.
- .2 Profile shall have round perforations on 16.5 mm (0.65") centres and having 8% open area, with similar appearance to MP-2 as specified in this Section.

.5 Metal siding finish (for steel and aluminum):
- .1 Conforming to AAMA 2605, high performance, three coat fluoropolymer coating system, 'Duranar (XL)' by PPG Industries or approved alternative.
- .2 Colours as follows:
  - .1 Colour for MP-1 and MP-2: To match PPG colour 'Sunstorm Grey Mica UC115057F'.
  - .2 Colour for SF3: To be selected by the Consultant.

.6 Structural shapes, plates, sag rods, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 300W.

.7 Hollow structural sections: CAN/CSA-G40.20/G40.21-M Grade 350W, Class H.

.8 Thermal spacer clip and girt support system:
- .1 Provide all components and accessories as required for complete and secure installation of thermal spacer clip and girt support system.
- .2 Z-girts: CAN/CSA S136-M; Minimum 1.2 mm thick, Z275 galvanized, unless otherwise indicated or recommended by manufacturer. Spacing and sizing as engineered to suit intended application.
- .3 Thermal spacer clip:
  - .1 Fibreglass thermal spacer clips fabricated from 100% pultruded glass fibre and thermoset polyester resin sub-framing thermal spacer, minimum 4.8 mm thick in depth as designed for wall system., 'Cascadia Clip' by Cascadia Windows and Doors.
  - .2 Specified manufacturer's products establish the minimum acceptable standards for the work of this Section. Approved thermal clip systems consisting of similar thermal performance will be considered provided they are deemed to be consistent with the system indicated and components specified herein.
- .4 Fasteners: Corrosion resistant stainless steel fasteners, type as recommended by thermal clip system manufacturer.

.9 Semi-rigid insulation: In accordance with Section 07 21 00.

.10 Breathable moisture barrier:
- .1 Self-adhering, tear-resistant, breathable moisture barrier with non-woven polypropylene (PP) fabric, UV stable acrylic coating and adhesive coating on the back, Class A rating in accordance with ASTM E84, in black colour; 'Delta Fassade SA' by Dorken or approved alternative by SRP Canada Inc. or approved alternative manufacturer.
- .2 Barrier to be complete with accessories as recommended by manufacturer for intended application and required for complete installation.

.11 Fascia, trim, closures, and flashings: Material, finish, colour, and fasteners to match siding material, 0.76 mm minimum base metal thickness minimum.

.12 Screw fasteners: ANSI B18.6.4, stainless steel Type 304. Exposed locations: With coloured nylon heads to match metal siding.

.13 Primer paint: CAN/CGSB-1.40-M.

.14 Isolation coating: Black bituminous coating, acid and alkali resistant material.

.15 Joint backing: Product as recommended by siding sealant manufacturer.

.16 Siding sealant: ASTM C920, Type S, Grade NS; One-part, ultra-low modulus, moisture curing silicone sealant, 'Dowsil 790' by Dow Consumer Solutions or Spectrem 1 by Tremco Ltd. Colour: As selected by Consultant.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 STRUCTURAL FRAMING

.1 Supply and install miscellaneous, additional structural framing members, required to complete metal siding and soffit system, where not indicated on Contract Drawings.

3.3 THERMAL SPACER, GIRT SUPPORTS AND INSULATION

.1 Thermal spacer, girt supports and insulation:
- .1 Install thermal spacer, girt support system and insulation in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Confirm thermal clip accommodates orientation of vertical and horizontal sub-framing.
- .3 Clip thermal spacer to Z-girt and fasten clip and girt to back-up structure, fastening through thermal spacer clip and into structure.

.4 Position Z-girts directly over thermal spacer before installation of fasteners.
.5 Completely install spacers, screws and sub-framing, prior to installing insulation.
.6 Install insulation in continuous contact with air and vapour control layer and neatly fitted between girts, supports, and anchoring system.
.7 Notch semi-rigid insulation at location of thermal spacer clip to match top and bottom of clip.
.8 Push insulation into place, compressing it at clip location. Ensure there are no linear gaps in adjacent insulation boards on either side of clip.
.9 Install insulation with insulation fasteners or impaling pins in accordance with manufacturer's written instructions.

3.4 BREATHABLE MOISTURE BARRIER

.1 Breathable moisture barrier:
.1 Install moisture barrier in accordance with manufacturer's written instructions with manufacturer recommended seams and joints.
.2 Remove release liner from back of membrane and press firmly onto substrate. Roll moisture barrier for continuous adhesion over entire substrate area; use manufacturer's recommended hand roller.
.3 Cut and fit moisture barrier as required for passage of protrusions, ensuring continuous adherence to substrate.
.4 No penetrations are to be left in installed barrier.

3.5 FASCIA, TRIM, CLOSURES, AND FLASHINGS

.1 Install fascia and trim including inside and outside corners, flashing, reveal trims, edgings, cap strips, drips, under-sill trim, fillers, closure strips, starter strips, and window or door trim, carefully formed and profiled.

3.6 METAL SIDING AND SOFFIT

.1 Install solid steel and perforated aluminum siding and soffit in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Apply isolation coating at 0.8 mm dry film thickness to prevent corrosive or electrolytic action between dissimilar materials such as aluminum to concrete, masonry, galvanized steel and similar conditions.

.3 Install metal siding in one piece, full height, except as indicated otherwise.

.4 Maintain joints in exterior siding, plumb, true to line, tight fitting, hairline joints.

.5 Attach metal siding and soffit system components to prevent warping, buckling, and deformation induced by restriction of thermal induced movement.

.6 Install corner pieces, closures, flashings, etc, where shown and where required. Provide formed steel closures around opening.

.7 Bed flashings, closures, and corner pieces in sealant to provide a weathertight installation.

3.7 **JOINT BACKING AND SIDING SEALANT**

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at siding system joints and perimeter for weathertight installation. Tool sealant to concave profile.

3.8 **TOUCH UP**

.1 Touch up marred surfaces with air dry formulation to match pre-finished siding if approved by Consultant, otherwise remove and replace damaged metal siding.

.2 Clean and touch up marred galvanized surfaces after installation, with zinc rich primer.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for fibre reinforced cement panel work in accordance with the Contract Drawings.

1.2 **REFERENCES**

.1 ASTM C920, Specification for Elastomeric Joint Sealants.

.2 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.3 CAN/CGSB 1.108-M, Bituminous Solvent Type Paint.

.4 CAN/CSA-G40.20/G40.21M, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.

1.3 **DESIGN REQUIREMENTS**

.1 Design fibre reinforced cement panel system in accordance with CSA S136, S136.1, and to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

.2 Design fibre reinforced cement panel system in accordance with following Climatic Design Data for Toronto contained in Ontario Building Code.
- .1 Design Temperature: January 1%, July 2 ½%.
- .2 Wind (Hourly Wind Pressures): 1 in 50 year occurrence.
- .3 Earthquake: Seismic Data as listed.

.3 Design miscellaneous, additional structural framing members as required to complete panel system, where not indicated on Contract Drawings.

1.4 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
  - .1 Dimensions, profiles, Products, wall elevations, details, arrangements of panels and joints, thicknesses, dimensions, locations of supports and fasteners and special shapes.

.3 Samples:
.1 Submit samples in accordance with the Conditions of the Contract:
.1 600 x 600 mm samples of fibre reinforced cement panel system showing fully assembled components including fibre reinforced cement panels and thermal spacer and sub-girts. Sample to be fabricated using exact colour specified.

.4 Reports: Submit written field inspection and test report results after each inspection.

5. Closeout Submittals: Provide maintenance instructions for incorporation into Operation and Maintenance Manual, specified in Section 01 78 23.

1.5 QUALITY ASSURANCE

.1 Retain a licensed Professional Engineer, registered to practice in the Province of Ontario, to perform following services for panel work:
.1 Design of fibre reinforced cement panel work and fully engineered system of anchorage for all work of this Section using the specified thermal spacer clip and girt support system.
.2 Review, stamp, and sign shop drawings.
.3 Conduct shop and field inspections and prepare and submit inspection reports.

.2 Mock-up:
.1 Construct on site one full scale in-situ mock-up of fibre reinforced cement panel wall assembly, sized at minimum 3 m x 3 m, in a location agreed upon with the Consultant for testing, including air leakage and water penetration.
.2 Demonstrate installation of moisture barrier, fibre reinforced cement panel complete with anti-graffiti coating finish in accordance with Section 09 96 23.
.3 Demonstrate finishes, colour, textures and quality of workmanship.
.4 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

.3 Pre-installation meeting: Arrange with manufacturer's representative, Contractor, and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Stockpile panels tilted to provide water run-off, free from ground contact on firm, level, non-staining supports extending full width of sheet and spaced not more than 450 mm apart. Cover components with opaque polyethylene sheet. Vent to allow air movement.

2 Products

2.1 **MATERIALS**

.1 Fibre reinforced cement panels (FRCP):
- .1 900 mm x 147 mm high x 13 mm thick, glass fibre reinforced cement panels, half panel, installation to have a horizontal offset in brick pattern. 'Fibre C, oko Skin' cladding manufactured by Rieder or approved alternative, in colour ‘Off White’.
- .2 Finishes: 50% of panels shall have a ‘Ferro’ texture and 50% shall have a ‘Ferro Light’ texture. Panels shall be installed randomly in terms of finish.

.2 Structural shapes, plates, sag rods, and similar items: CAN/CSA-G40.20-G40.21-M, Grade 300W.

.3 Hollow structural sections: CAN/CSA-G40.20/G40.21-M Grade 350W, Class H.

.4 Thermal spacer clip and girt support system:
- .1 Provide all components and accessories as required for complete and secure installation of thermal spacer clip and girt support system.
- .2 Z-girts: CAN/CSA S136-M; Minimum 1.2 mm thick, Z275 galvanized, unless otherwise indicated or recommended by manufacturer. Spacing and sizing as engineered to suit intended application.
- .3 Thermal spacer clip:
  - .1 Fibreglass thermal spacer clips fabricated from 100% pultruded glass fibre and thermoset polyester resin sub-framing thermal spacer, minimum 4.8 mm thick in depth as designed for wall system., ‘Cascadia Clip’ by Cascadia Windows and Doors.
  - .2 Specified manufacturer's products establish the minimum acceptable standards for the work of this Section. Approved thermal clip systems consisting of similar thermal performance will be considered provided they are deemed to be consistent with the system indicated and components specified herein.
- .4 Fasteners: Corrosion resistant stainless steel fasteners, type as recommended by thermal clip system manufacturer.

.5 Semi-rigid insulation: In accordance with Section 07 21 00.

.6 Breathable moisture barrier:
- .1 Self-adhering, tear-resistant, breathable moisture barrier with non-woven polypropylene (PP) fabric, UV stable acrylic coating and adhesive coating on the back, Class A rating in accordance with ASTM E84, in black colour; ‘Delta Fassade SA’ by Dorken or approved alternative by SRP Canada Inc. or approved alternative manufacturer.
- .2 Barrier to be complete with accessories as recommended by manufacturer for intended application and required for complete installation.

.7 Waterstop, Joint tape made of rubber, neoprene 110 mm wide.

.8 Fasteners:
- .1 Fasteners to be corrosion resistant stainless steel, installed in an exposed manner, complete with colour matched heads to match panel colours. Types as recommended by panel manufacturer.
- .2 Size and spacing required for type of substrate and Project conditions, to meet performance requirements.
- .3 No dissimilar materials allowed, in selection of fasteners.

.9 Isolation coating: CAN/CGSB-1.108-M; Bitumastic coating, acid and alkali resistant material.

.10 Joint backing: Product as recommended by sealant manufacturer.

.11 Panel sealant: ASTM C920, Type S, Grade NS; One-part, neutral cure silicone sealant, 'Dowsil 795' by Dow Consumer Solutions or Spectrem 2 by Tremco Ltd. Colour: To match panels.

.12 Anti-graffiti coating: In accordance with Section 09 96 23.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 STRUCTURAL FRAMING

.1 Supply and install miscellaneous, additional structural framing members, required to complete panel system, where not indicated on Contract Drawings.

3.3 THERMAL SPACER, GIRT SUPPORTS AND INSULATION

.1 Thermal spacer, girt supports and insulation:
- .1 Install thermal spacer, girt support system and insulation in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Confirm thermal clip accommodates orientation of vertical and horizontal sub-framing.
- .3 Clip thermal spacer to Z-girt and fasten clip and girt to back-up structure, fastening through thermal spacer clip and into structure.
- .4 Position Z-girts directly over thermal spacer before installation of fasteners.
- .5 Completely install spacers, screws and sub-framing, prior to installing insulation.
- .6 Install insulation in continuous contact with air and vapour control layer and neatly fitted between girts, supports, and anchoring system.
- .7 Notch semi-rigid insulation at location of thermal spacer clip to match top and bottom of clip.

.8 Push insulation into place, compressing it at clip location. Ensure there are no linear gaps in adjacent insulation boards on either side of clip.

.9 Install insulation with insulation fasteners or impaling pins in accordance with manufacturer's written instructions.

3.4 BREATHABLE MOISTURE BARRIER

.1 Breathable moisture barrier:

.1 Install moisture barrier in accordance with manufacturer's written instructions with manufacturer recommended seams and joints.

.2 Remove release liner from back of membrane and press firmly onto substrate. Roll moisture barrier for continuous adhesion over entire substrate area; use manufacturer's recommended hand roller.

.3 Cut and fit moisture barrier as required for passage of protrusions, ensuring continuous adherence to substrate.

.4 No penetrations are to be left in installed barrier.

.5 Barrier will be installed right before cladding and will be black to conceal the strapping, per manufacturer's details. Consultant to approve installation.

3.5 WATERSTOP

.1 Install neoprene waterstop, 110 mm wide, between all framing members and concrete panels.

3.6 FIBRE REINFORCED CEMENT PANELS

.1 Erect fibre reinforced cement panels in straight lines, true, level and plumb. All vertical and horizontal panel joints shall be supported continuously by a framing member.

.2 Use abrasive carborundum saw blades and carbide tipped masonry drills for making modifications to panels on site. Paint all exposed cut edges.

.3 Cut and flash wall penetrations with metal flashing.

3.7 ANTI-GRAFFITI COATING

.1 Anti-graffiti coating to be applied in accordance with Section 09 96 23.

3.8 JOINT BACKING AND SEALANT

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at panel system joints and perimeter for weathertight installation. Tool sealant to concave profile.

3.9 TOUCH UP

.1 Touch up marred surfaces to match pre-finished panels if approved by Consultant, otherwise remove and replace damaged panel.

.2 Clean and touch up marred galvanized surfaces after installation, with zinc rich primer.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for modified bituminous roofing work in accordance with the Contract Documents.

.2 Work of this Section shall allow for the following roofing systems:
- .1 Roof type (R1) - main roof and above outdoor play area:
  - .1 Self-adhering base sheet and torched cap sheet modified bituminous membranes on plywood sheathing and strapping (air space) on sloped roof structure as shown on Contract Drawings, and rubber paver system which shall be as specified in this Section.
  - .2 Cellulose insulation and air/vapour control barrier shall be provided under work of Sections 07 21 00 and 07 27 01, respectively.
  - .3 Photo voltaic (PV) panel system to be installed over roof system as shown on Contract Drawings.
- .2 Roof type (R2) - outdoor play, tile and main entry roof:
  - .1 Mopped base sheet and torched cap sheet modified bituminous membranes on cover board, tapered and standard polyisocyanurate insulation , air/vapour retarder roofing membrane.
  - .2 Refer to Division 32 Landscape Sections as required for rubber play surface, tiles and permeable base.
- .3 Roof type (R3) - storage roof: Self-adhering base sheet and torched cap sheet modified bituminous membranes on plywood sheathing as shown on Contract Drawings.

1.2 **REFERENCES**

.1 ASTM D6162/D6162M, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

.2 CSA A123.4-M, Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems.

.3 CSA A123.21, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.

.4 CAN/ULC S107, Fire Test For Roof Coverings.

.5 CAN/ULC S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.

.6 CRCA Roofing Manual, Canadian Roofing Contractors Association.

.7 OIRCA, Ontario Industrial Roofing Contractors Association.

1.3 DESIGN REQUIREMENTS

.1 Roof systems as shown on Contract Drawings shall be covered with photo voltaic (PV) panel system.

.2 Roof hatches:
- .1 Cover and curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
- .2 Cover shall be reinforced to support a minimum live load of 195kg/m2 with a maximum deflection of 1/150th of the span or 97kg/m2 wind uplift.
- .3 Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
- .4 Operation of the cover shall not be affected by temperature.
- .5 Entire hatch shall be weather tight with fully welded corner joints on cover and curb.

1.4 SUBMITTALS

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Systems, materials, and methods of installation proposed for use, showing system and each component. Certify compliance of each component with applicable standards.
  - .2 Submit cold weather construction procedures and methods of protection which will be initiated, installed and maintained when ambient temperature falls below 0^0C.

.2 Shop Drawings: Submit Shop Drawings in accordance with Section 01 33 00 indicating roof layout, sections, details, materials, fastener layout, flashings and membrane terminations, perimeter securement, air/vapour retarder membrane terminations, insulation wrapping procedures, tapered insulation layout, membrane penetrations, control joints, roof walkway system, roof accessories and manufacturer recommended adhesion pattern to meet wind uplift requirements.

.3 Samples:
- .1 Submit following samples in accordance with Section 01 33 00:
  - .1 Air/vapour retarder membrane.
  - .2 Insulation boards.
  - .3 Tapered insulation.
  - .4 Cover boards.
  - .5 Roofing membranes.
  - .6 Drainage board.
  - .7 Filter fabric.
  - .8 Roof accessories.

.4 Reports and Certificates:
- .1 Submit copy of membership in good standing of OIRCA, list of relevant project experience and certification from roof manufacturer certifying that installer is certified to install specified roof assemblies.
- .2 Submit certification from manufacturer that roof system has a minimum Class C classification in accordance with CAN/ULC-S107.
- .3 Submit Pre-Installation Notice (PIN): Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the manufacturer.
- .4 Submit project specific report, issued by certified material testing laboratory, confirming that proposed roofing assembly conforms to CSA A123.21. As a minimum report shall indicate uplift pressures for field of roof, perimeter of roof and corners of roof.
- .5 Submit written inspection reports in duplicate from manufacturer, stating that materials proposed for use on this project meet criteria specified and are compatible with each other.

.5 Project close-out submittals:
- .1 Submit close-out submittals in accordance with Section 01 78 23.
- .2 Submit membrane manufacturer's certificate that membrane has been installed in accordance with Contract Documents.

1.5 QUALITY ASSURANCE

.1 Installer's qualifications: Perform work of this Section by a company that is:
- .1 A member in good standing of the Ontario Industrial Roofing Contractors Association (OIRCA),
- .2 Has a minimum of 5 years proven acceptable roofing experience on installations of similar complexity and scope and
- .3 Is certified by the roof manufacturer to install the specified roof assemblies and meet warranty requirements.

.2 Testing: Provide flood testing conducted by an independent testing agency of the specified roofing products.

.3 Perform roofing work in accordance with the CRCA Roofing Specifications Manual and in accordance with membrane manufacturer's printed installation instructions.

.4 Ensure roofing system has been tested and conforms to CAN/CSA A123.21 to ensure wind uplift resistant applicable to the Place of Work and will meet intended warranty requirements.

.5 Roof system shall have a minimum Class C classification in accordance with CAN/ULC-S107.

.6 Ensure membrane manufacturer's representative has full access to this work for proper inspection prior to and during membrane installation. Roof inspections shall be conducted when the roof is 10%, 50%, and 100% complete minimum. Membrane manufacturer to certify that roof installation was in conformance to manufacturer's written requirements.

.7 Mock-up:
- .1 Construct one mock-up of penetration sealed with liquid resin flashing, in a location acceptable to the Consultant.
- .2 Demonstrate quality of workmanship.
- .3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

.8 Pre-installation meetings: Arrange meeting on Site to be attended by Consultant, Contractor, and roofing manufacturer's representative to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.6 **DELIVERY, STORAGE, AND HANDLING**

.1 Deliver, store and handle Products in accordance to Section 01 60 00 and as specified herein.

.2 Deliver Products in original containers and keep in protective storage until used.

.3 Indicate on containers or wrappings of Products:
- .1 Manufacturer's name and brand.
- .2 Compliance with applicable standard.
- .3 Weight of material, where applicable.

.4 Handle and store Products to prevent damage. Keep manufacturer's labels and seals intact. Store roofing rolls on end to prevent flattening. Ensure that shelf life of Products has not expired.

.5 Protect Products from inclement weather. Keep insulation, insulation overlay, and roofing membranes absolutely dry. Remove from storage only as much Product as can be applied, made weathertight, and covered with roofing in same day. Do not install Products which are damp at time of installation or showing evidence of having been damp or exposed to moisture.

.6 Store roofing membranes for 24 hours minimum in area kept at 10^0C minimum and remove for application with minimum exposure to low temperatures. Keep membranes dry, stored off-the-ground, on end and well ventilated.

.7 Do not store more than one day's supply of Products on the roof at any time. Stack materials on pallets on roof. Cover Products with incombustible waterproof tarpaulin whenever work is interrupted, or when there is precipitation of any kind.

.8 Distribute Products stored on roof. Install bases under equipment and Products to distribute weight. Do not store Products on, or transport materials across, completed roof areas.

.9 Place 19 mm thick plywood runways over work to enable movement of Products and other traffic.

.10 Where hoisting or pumping occurs adjacent to construction, hang tarpaulins to protect walls and other surfaces. Locate kettle so smoke will not discolour adjacent building surfaces.

.11 Locate a 9 kg fire extinguisher fully charged and in operable condition at installation location, of proper type for Products being used and stored.

.12 Cover walls and adjacent work where Products are hoisted or used.

.13 Use warning signs and barriers and maintain in good order until completion of work.

.14 Clean off drips and smears of bituminous immediately.

.15 Dispose of rain water off roof and away from face of building until roof drainage system has been installed and connected.

.16 At end of each day's work or when stoppage occurs due to inclement weather, protect completed work and Products.

1.7 **SITE CONDITIONS**

.1 Install roofing on dry deck, free of snow and ice, use only dry Products and apply only during weather that will not introduce moisture into roofing system.

.2 Apply roofing only when air and surface temperatures are above 4^0C, have been so for at least 48 hours and are not likely to go below 4^0C, until work is completed.

.3 Proceed with work when temperatures are below 4^0C only with mutual documented agreement between Contractor and Consultant.

1.8 **EXTENDED WARRANTY**

.1 At completion of this work, provide a signed OIRCA warranty to the Owner covering defects of workmanship for standard 2 year warranty period. Agree to make good promptly any defects which occur or become apparent within the warranty period in conjunction with the membrane manufacture's warranty. Defects shall include but not be limited to leakage, failure to stay in place, lifting, and deformation.

.2 At completion of this work, provide a signed warranty from the roofing system manufacturer to the Owner covering defects in workmanship and materials for a period of 20 years commencing from Contract Completion. Warranty shall include air/vapour retarder membrane, roofing membrane, roof insulation, sloped insulation, and all other products supplied by roofing system manufacturer. Scope of coverage: Repair and/or replace damaged roofing material caused by the ordinary wear and tear of the elements, manufacturing defect, and the workmanship used to install these materials.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, primers are to have low VOC content limits.

.2 Acceptable membrane manufacturers:
- .1 Henry Company Canada Inc. (Henry)
- .2 IKO Industries Inc. (IKO)
- .3 Soprema Waterproofing Inc. (Soprema)

.3 Plywood sheathing: In accordance with Section 06 10 00.

.4 Air/vapour retarder roofing membrane:
- .1 Provide self-adhering air/vapour membrane at all upturns and vertical surfaces to ensure continuity of control layers, protect roof insulation and prevent water ingress if leakage occurs through vertical wall/surfaces above roofing. Roofing manufacturer recommended liquid applied vapour retarder may be considered by the Consultant.
- .2 Self-adhering air/vapour retarder roofing membrane: Minimum 0.8 mm thick self adhesive membrane consisting of SBS modified bitumen adhesive bottom and tri-laminated woven polyethylene top with silicone release film. 'Vapour Block SA' by Henry, 'M.V.P.' by IKO, or 'Sopravap'r by Soprema.

.5 Insulation (standard and tapered):
- .1 Polyisocyanurate insulation: CAN/ULC S704, rigid, closed cell, polyisocyanurate foam insulation integrally laminated to perforated black glass reinforced felt facers, square edges, thickness as indicated on Drawings, use maximum size board possible. Insulation thickness under 50 mm use single layer board. Insulation thickness over 50 mm use two equal thickness boards.
- .2 Tapered Insulation: Factory pre-engineered tapered polyisocyanurate insulation in thickness sufficient for slopes indicated; manufactured by Accu-Plane Systems Inc. IKO, Posi-Slope Manufacturing Ltd. or Soprema.

.6 Cover board: Mineral fortified asphaltic core formed between two layers of asphaltic saturated fibreglass liners, 6.4 mm thick; 'Protectoboard' by IKO or approved alternative.

.7 Asphalt primer: Asphalt modified bitumen with thermoplastic polymers.

.8 Asphalt: CSA 123.4-M;
- .1 Type 2 for slopes up to 1:8.
- .2 Type 3 for slopes from 1:8 to 1:4.

.9 Base sheet membrane and flashing (mopped - for use at R2): ASTM D6162, Type 1, Grade S, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non-woven polyester and glass fiber composite reinforcing, having the following minimum characteristics:
- .1 Thickness: 2.2 mm.
- .2 Reinforcing fabric weight: 200 g/m^2.
- .3 Cold flex: -18 deg. C.
- .4 Tensile strength: 13 kN/m.
- .5 Ultimate elongation: 26%.
- .6 Tensile-tear: 289 N.
- .7 Bottom and top surfaces: Sanded/Polyethylene.

.10 Base sheet membrane and flashing (self-adhering - for use at R1 and R3): ASTM D6162, Type 1, Grade S, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non-woven polyester and glass fiber composite reinforcing, 'Sopralene Flam Stick' by Soprema or approved alternative, having the following minimum characteristics:
- .1 Thickness: 3.0 mm.
- .2 Weight: 3.5 kg/m^2.
- .3 Cold flex: -30 deg. C.
- .4 Breaking strength: 13.5 kN/m.
- .5 Ultimate elongation: 65%.
- .6 Tear resistance: 125 N.
- .7 Static puncture resistance: 560 N.
- .8 Bottom and top surfaces: Self Adhesive/Polyethylene.

.11 Cap sheet membrane and flashing (torched, typical): ASTM D6162, Type 1, Grade S, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non-woven polyester and glass fiber composite reinforcing, 'Soprastar Flam HD GR' by Soprema or approved alternative, having the following minimum characteristics:
- .1 Thickness: 4.0 mm.
- .2 Roll weight: 4.9 kg/m^2.
- .3 Cold flex: -30 deg. C.
- .4 Breaking strength: 19.5 kN/m.
- .5 Ultimate elongation: 61%.
- .6 Tear resistance: 70 N.
- .7 Static puncture resistance: 470 N.
- .8 Dimensional stability: -0.2%.
- .9 Bottom and top surfaces: Polyethylene/Granules in light colour as selected by the Consultant from manufacturer's standard colour range.

.12 Plastic cement: Trowel grade asphalt mastic.

.13 Roofing nails: Galvanized steel, minimum 19 mm head of length to penetrate wood nailer minimum 19 mm.

.14 Roof drains: In accordance with Division 22 - Mechanical.

.15 Stack flashing units: Aluminum pre-insulated stack jack; 'Model SJ-38' by Thaler Roofing Specialties Products Inc. or approved alternative, sizes as shown or required.

.16 Pipe supports: Aluminum pipe supports complete with stainless steel straps, 'MERS - 610A' or 'MERS - 600A' by Thaler Roofing Specialties Products Inc. or approved alternative.

.17 Roof vents: Aluminum roof vents with diameter of 254 mm, 'EVF-2-A' by Thaler Roofing Specialties Products Inc. or approved alternative.

.18 Electrical penetrations: Liquid tight flexible conduit flashing, 'MEF-2A' by Thaler Roofing Specialties Products Inc. or approved alternative.

.19 Rubber roof walkway pads: 37 mm thick, slip resistant, rubber walkway pads with built-in pedestal design, tile locking system, high density wear layer and compressed dimension of 600 x 600 mm, 'Durastrong Rubber Rooftop Tile' by SofSurfaces Inc. approved alternative in colour 'Bedrock'.

.20 Drainage board: Three-dimensional dimpled core and geotextile fabric complete with adhesive as required for installation and suitable for roof application. Type as recommended by roofing manufacturer.

.21 Filter fabric sheet: High density polyethylene filter fabric with UV inhibitors; 'Fabrene VIIE9' by PGI-Fabrene Inc. or approved alternative.

.22 Rubber play surface, tiles and permeable base: In accordance with Division 32, Landscape Sections.

.23 Roof hatch:

.1 Preassembled 915 x 762 mm single leaf metal roof scuttle with mill finish, 'Type S-50TB' by Bilco or approved alternative.

.2 Refer to Contract Drawings for additional insulation on upstand of the roof hatch.

.3 Cover: Shall be 2.3 mm thick aluminum with a 127 mm beaded flange with formed reinforcing members. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. Cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

.4 Cover insulation: Shall be 75 mm thick polyisocyanurate with an R-value = 20.3 (U=0.279 W/m2K), fully covered and protected by a 1 mm thick aluminum liner.

.5 Curb: Shall be 305 mm in height and of 2.3 mm thick aluminum. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. The curb shall be formed with a 140 mm flange with 11 mm holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip flashing system, including stamped tabs, 150 mm on center, to be bent inward to hold single ply roofing membrane securely in place.

.6 Curb insulation: Shall be 75 mm thick polyisocyanurate with an R-value = 20.3 (U=0.279 W/m2K).

.7 Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.

.8 Hardware:

.1 Heavy stainless steel pintle hinges shall be provided.

.2 Cover shall be equipped with a spring latch with interior and exterior turn handles.

.3 Roof hatch shall be equipped with interior and exterior padlock hasps.

.4 The latch strike shall be a stamped component bolted to the curb assembly.

.5 Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 25 mm diameter red vinyl grip handle to permit easy release for closing.

.6 Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed.

.7 Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

.24 Roof hatch safety railing: Fiberglass-reinforced polymer (FRP) posts and rails in high visibility, safety yellow colour, treated with a UV inhibitor. 6 mm thick hot dip galvanized steel mounting brackets, type 302 stainless steel gate hinges and post guides. All fasteners are type 316 stainless steel. ‘Bil-Guard 2.0 Roof Hatch Railing System’ by Bilco or approved alternative.

.25 Roof hatch safety post: High strength square steel post with high visibility, powder coat finish in safety yellow colour. Design post to automatically lock into position when fully extended and to have release lever to disengage. All fasteners are type 316 stainless steel. ‘LadderUp Safety Post’ by Bilco or approved alternative.

.26 Pitch pocket pans, pourable sealer and metal flashings: In accordance with Section 07 62 00.

.27 Liquid applied resin flashings:

.1 Liquid applied flashings may be used at steel penetrations in lieu of pitch pocket method shown on Contract Drawings and specified in Section 07 62 00.

.2 Resin for flashing applications: One-component polyurethane/bitumen resin for use in combination with fleece fabric to form a monolithic, reinforced flashing membrane, ‘Alsan Flashing’ by Soprema or approved alternative.

.3 Fleece for flashing reinforcement: Woven, 100 g/m², polyester fabric reinforcement suitable for use with roof system, ‘Flashing Reinforcement’ by Soprema or approved alternative.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

.1 Prior to commencement of work ensure:
- .1 Environmental and Site conditions are suitable for material installation in accordance with manufacturer's recommendations.
- .2 Decks are sound, straight, smooth, dry, free of oils, grease, snow, ice or frost, and swept clean of dust and debris.
- .3 Curbs have been built and plywood and lumber nailer plates have been installed.

.2 Supply to trades concerned in ample time, inserts, reglets and accessories to be built into Work. Assist in setting such items.

.3 Cooperate with respective trades to determine methods and procedures to ensure watertight junctions to items passing through roof.

.4 Do not use direct fired equipment. Use only kettles equipped with thermometers or gauges in good working order.

.5 Locate kettles in a safe place outside of building. When locating kettles, give consideration to direction of prevailing winds, building fans and air handling units to minimize possibility of smoke and fumes entering surrounding occupied buildings. If wind direction causes smoke and fume problems, relocate kettles on a daily basis as directed by the Consultant.

.6 Maintain supervision while kettles are in operation and maintain metal covers for kettles to smother flames in case of fire. Supply suitable fire extinguishers.

.7 Maintain efficiency of equipment by frequent cleaning. Remove carbonized bitumen.

.8 Control heating of bitumen, prevent overheating. Maintain an accurate, easily read thermometer during heating. Comply with the following bitumen heating tolerances:
- .1 Maximum heating temperature: 240^0C.
- .2 Application temperature: Equiviscous Temperature (EVT).
- .3 Kettles: Holding time maximum 4 hours at maximum 177^0C.

.9 Use heating equipment equipped with thermometers which show temperature of asphalt at all times. During cold weather however, it may become necessary to heat bitumen beyond the normal temperatures specified herein, to obtain EVT temperature range at point of application on roof. If such conditions occur, implement cold weather procedures, and before proceeding with higher temperatures, obtain prior review from Consultant and inspection authorities approval, and take necessary safety precautions.

.10 In cold weather insulate hauling equipment and re-circulation lines to minimize heat loss.

3.3 **PLYWOOD DECK SHEATHING**

.1 Plywood deck sheathing to be applied in accordance with Section 06 10 00.

3.4 **AIR/VAPOUR RETARDER ROOFING MEMBRANE**

.1 Prime substrate to manufacturers recommendations.

.2 Install air/vapour retarder membrane in accordance with manufacturers written instructions.

.3 Lap air/vapour retarder membrane retarder ends and edges 50 mm minimum. Roll air/vapour retarder membrane and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.

.4 Cut and fit air/vapour retarder membrane as required for passage of protrusions, ensuring continuous adherence to substrate.

.5 At junction of deck to vertical surfaces and along perimeter of roof deck, extend air/vapour retarder membrane, set in adhesive, beyond the point where insulation will terminate.

.6 Seal penetrations, end and side laps, and ends of air/vapour retarder membrane to substrates and to wall system air/vapour control layer to maintain continuity of building air/vapour retarder system.

3.5 **INSULATION**

.1 Prior to installation of insulation, examine deck and make good damage.

.2 Use full size insulation boards wherever possible, and minimum half boards at abutting vertical surfaces.

.3 Install insulation in straight parallel rows, with long dimension parallel to long dimension of roof. Stagger end joints of insulation boards in adjacent rows 50%.

.4 Place insulation boards in moderately tight contact at joints between boards and abutting surfaces with gaps between boards not exceeding 1.5 mm. Under no circumstances shall the roofing membrane be left unsupported over a space greater than 3 mm.

.5 When cutting insulation board cut completely through board thickness; do not break or tear insulation board to fit a detail. Any areas of insulation system having voids will be rejected.

.6 When installing multiple layers of insulation, all joints between layers shall be staggered at least 300 mm.

.7 Do not lay more insulation than can be completely covered as finished roofing system on the same day.

.8 Do not cut off insulation in straight lines at the end of a work period, allow stepped boards for toothing-in.

.9 Install polystyrene rigid insulation in a minimum of two layers.

.10 Install polystyrene rigid insulation, in full moppings of asphalt, in straight parallel rows, with long dimension parallel to long dimensions of roof.

.11 Install subsequent layers of insulation, in full moppings of asphalt, in straight parallel rows, with long dimension parallel to previous layer of insulation with joints offset as recommended by insulation manufacturer.

.12 Install tapered insulation as shown on Contract Drawings and in accordance with manufacturer's details and instructions. Miter roof insulation edges at ridge, valley and other similar non-planar conditions.

.13 Install cover board over tapered insulation and plywood sheathing in straight parallel rows, with long dimension parallel to long dimensions of insulation. Stagger side joints in adjacent rows minimum 50%.

3.6 **MEMBRANE INSTALLATION**

.1 Install materials in accordance with manufacturer's instructions.

.2 Install membrane free of blisters, wrinkles and fishmouths in accordance with membrane manufacturer's instructions. Avoid asphalt seepage at seams in cap sheet greater than 5 mm.

.3 Base sheet application (mopped):
- .1 Starting at low point of roof, perpendicular to slope, unroll base sheet dry over substrates, align and reroll for both ends.
- .2 Unroll and install membrane in full moppings of asphalt. Extend base sheet to base of cant.
- .3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.

.4 Base sheet application (self-adhering):
- .1 Unroll base sheet dry over substrates, align and reroll in halves.
- .2 Cut release paper and peel back on section of roll to be adhered. Peel lower part of release paper back on itself.
- .3 Unroll half of roll while removing release paper, immediately apply pressure on adhered membrane with 27 kg steel roller. Re-roll second half of roll and install in same manner as first.
- .4 Cut off corners at end laps to be covered by subsequent rolls. Seal all joints with heat gun and rounded end trowel.

.5 Cap sheet application (torched):
- .1 Starting at low point on roof, perpendicular to slope, unroll cap sheet, dry over base sheet, align and reroll from both ends.
- .2 Unroll and torch cap sheet onto base sheet extending to base of cant taking care not to burn membrane or its reinforcement.
- .3 Lap sheets 75 mm minimum for side laps and 150 mm minimum for end laps. Offset joints in cap sheet 300 mm minimum for those in base sheet.
- .4 Embed surface granules on end laps by heating and using a round-nosed roofing trowel, prior to installation of following sheet.

3.7 MEMBRANE FLASHING INSTALLATION

.1 Install flashing free of blisters, sags, wrinkles and fishmouths in accordance with the manufacturer's recommendations. Avoid asphalt seepage at seams greater than 5 mm.

.2 Base flashing (mopped):
- .1 Lay base flashings in vertical strips 1000 mm wide to curb surfaces as shown.
- .2 Extend on to flat roof surface minimum 100 mm from toe of cant.
- .3 Make 75 mm side laps and 100 mm end laps from laps in base sheet of roof membrane.
- .4 Install flashings in full moppings of asphalt directly to substrates, proceeding from bottom to top.
- .5 Nail top leading edge to nailer at 300 mm o.c.

.3 Base flashing (self-adhering):
- .1 Apply primer to substrate.
- .2 Lay base flashings in vertical strips 1000 mm wide to curb surfaces as shown.
- .3 Extend on to flat roof surface minimum 100 mm from toe of cant.
- .4 Make 75 mm side laps and 100 mm end laps from laps in base sheet of roof membrane.
- .5 Install flashings by removing release paper and pressing onto substrate proceeding from top to bottom, heat weld base sheet where flashing overlaps.
- .6 Apply uniform pressure over flashing surface and seal seams with rubber roller.
- .7 Nail top leading edge to nailer at 300 mm o.c. seal all joints with weld gun and rounded end trowel.
- .8 Cut off corners at end laps to be covered by subsequent rolls of flashing.

.4 Cap flashing (torched):
- .1 Lay cap flashing in vertical strips 1000 mm wide to curb surfaces as shown.
- .2 Extend on to flat roof surface minimum 150 mm from toe of cant.
- .3 Make 75 mm side laps and 100 mm end laps from cap sheet laps and base flashing laps.
- .4 Embed surface granules on laps over cap sheet roofing by heating and use of round-nosed roofing trowel.
- .5 Torch cap flashing directly to cap sheet roofing and to base sheet flashing proceeding from bottom to top
- .6 Soften underside of membrane by torching, without overheating, resulting in uniform adhesion over surface of base flashing.
- .7 Extend cap sheet as shown and nail leading edge to nailers 300 mm o.c.

3.8 LIQUID FLASHING INSTALLATION

.1 Apply resin flashing materials in accordance with manufacturer's written instructions.

.2 After mixing, apply resin to clean and prepared substrate at the required consumption using manufacturer recommended equipment. Resin to be spread evenly onto intended surface.

.3 Flashing penetrations as required to provide a complete, water and air tight installation.

3.9 DRAINAGE BOARD AND FILTER FABRIC

.1 Supply and install drainage board in accordance with detailed system, reviewed shop drawings and manufacturer's written instructions.

.2 Install filter fabric over drainage board in accordance with manufacturer’s written requirements and as follows:
- .1 Overlap all edges a minimum of 300 mm.
- .2 Install the fabric so that no joints will exist between the sheets parallel to and within 1800 mm of the roof perimeter.
- .3 Extend the fabric to 50 mm - 75 mm above ballast or paving at the perimeter and at penetrations.
- .4 Extend the fabric to drain bases or bonnets, but to not cover drains or restrict water flow to the drain.
- .5 Install fabric around all penetrations in order to prevent stone or debris entry into the space between the penetration and the drainage board.

.3 Coordinate with Division 32 as required for landscaping work that is to be installed over intended roofing areas.

3.10 ROOF ACCESSORIES

.1 Prior to application of membrane set stack flashing units, roof hatch, prefabricated equipment curbs, and other roof penetration accessory units in accordance with manufacturer's Product data. Install removable cap per accessory manufacturer's Product data as applicable.

.2 Seal joints at items projecting through membrane watertight to acceptance of Consultant.

.3 Railing system and safety post: Erect railing and safety post in accordance with reviewed shop drawings, manufacturer’s written instructions and in true vertical and horizontal planes, rigid, and free from whip.

.4 Roof pavers:
- .1 Install rubber pavers in accordance with manufacturer’s written instructions and locations as shown on Contract Drawings.
- .2 Pavers to be interlocked together and have a smooth transition from paver to paver.

3.11 FIELD QUALITY CONTROL

.1 Inspect vapour retarder continuity after first blower door test immediately prior to installation of subsequent construction. Repair punctures, rips and tears to ensure continuity of vapour retarder.

.2 Where punctures and tears are extensive, replace entire damaged section.

.3 Do not cover or permit to be covered any portion of vapour retarder until it has been inspected by Consultant.

.4 Check completed membrane welds for continuity after cooling by use of screw driver run along welded seams and showing uninterrupted extrusion of melted asphalt material.

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

3.12 CLEANING

.1 Clean roofing, metal, masonry, and similar items of dirt, cuttings, stains and foreign matter upon completion of the work.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for flashing and sheet metal work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

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

.3 ASTM C920, Specification for Elastomeric Joint Sealants.

.4 ASTM C1193, Standard Guide for Use of Joint Sealants.

.5 CRCA Roofing Manual, Canadian Roofing Contractors Association.

.6 CSA A123.21, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.

1.3 **DESIGN REQUIREMENTS**

.1 Design flashing elements and fastenings to withstand wind loading and perimeter and corner uplift pressures for roof system in accordance with CSA A123.21.

1.4 **SUBMITTALS**

.1 Shop drawings:
  .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
    .1 Proposed method of shaping, forming, jointing.
    .2 Application of flashing and sheet metal work.
    .3 Flashing fastening method, fasteners, and fastener spacing to meet wind loading and uplift pressures.

.2 Samples:
  .1 Submit following samples in accordance with Section 01 33 00:
    .1 50 x 50 mm samples of sheet metal material, colour and finish.
    .2 Representative sample section of prepainted metal flashing illustrating S locking jointing method, minimum 600 mm long.
    .3 Representative sample section of prepainted metal flashing illustrating splicing jointing method, minimum 100 mm long.

1.5 **QUALITY ASSURANCE**

.1 Mock-up:
- .1 Construct one mock-up of a flashing corner condition, in location acceptable to Consultant.
- .2 Construct one mock-up of a downspout, in a location acceptable to the Consultant.
- .3 Construct one mock-up of splice joint flashing application at round column adjoining with parapet cap flashing, in a location acceptable to the Consultant.
- .4 Construct one mock-up of a pitch pocket pan filled with pourable sealer, in a location acceptable to the Consultant.
- .5 Demonstrate finish, colour, and quality of workmanship.
- .6 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, sealants and paints are to have low VOC content limits.

.2 Prepainted sheet steel:
- .1 ASTM A653/A653M; Classification LFQ, Grade A, Z275 zinc coating designation, 0.60 mm minimum base steel thickness, commercial quality, prefinished with Perspectra Series coating system by ArcelorMittal Dofasco, or WeatherXL by Vicwest Steel.
- .2 Colours
  - .1 Colour (Type 1): To match Vicwest Steel colour ‘QC 7500 Silver (Metallic)’.
  - .2 Colour (Type 2): To match Benjamin Moore colour ‘Eccentric Lime (2027-30)’.

.3 Stainless steel sheet: ASTM A167, Type 316, 0.90 mm minimum thickness, for use at scuppers and flashings at sumped area at each drain.

.4 Sealant: ASTM C920, Type S, Grade NS, Class 25; High-performance, medium-modulus, one-part, neutral-cure silicone sealant. ‘Dowsil CWS’ by Dow Consumer Solutions, ‘Sikasil 305CN' by Sika or ‘Tremsil 400' by Tremco.

.5 Pourable sealer (pitch pocket pans):
- .1 Two component, low odour, quick-setting, asbestos free urethane sealant. ‘TremSEAL Pitch Pocket Sealer’ by Tremco or approved alternative.
- .2 Option of liquid resin flashings for steel penetrations as specified in Section 07 52 00.

.6 Starter strips: Starter strips to be continuous, of same material as flashing used, 1.2 mm thick.

.7 Gutter membrane: 1.5 mm thick, non-reinforced, cured, synthetic single-ply EPDM. Adhesive as recommended by EPDM manufacturer.

.8 Fasteners: Flat head roofing nails of length, type and thickness suitable for metal flashing application.

.9 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.10 Touch-up paint: Same colour and material as prepainted sheet steel, as recommended by prefinished coating manufacturer.

2.2 **FABRICATION**

.1 Fabricate copings, flashings, curb counter flashings, starter strips, pitch pocket pans, scuppers, gutters, downspouts, and miscellaneous flashings in accordance with CRCA and to details shown.

.2 Form prepainted sheet material at shop to shapes shown. Make end joints where adjacent lengths of metal flashing meet, in accordance with jointing method specified.

.3 Form pieces in 2400 mm maximum practical lengths. Make allowance for expansion at joints. Provide equal lengths of flashing in any given run.

.4 Hem exposed edges 13 mm minimum on underside for appearance and stiffness. Mitre and seal corners with sealant.

.5 Reglets and cap flashing: Form flashings of as detailed and in accordance with CRCA. Provide slotted fixing holes and steel/plastic washer fasteners.

.6 Gutters and downspouts:
- .1 Form gutters and downspouts from prefinished galvanized steel sheet metal in accordance with CRCA requirements.
- .2 Sizes and profiles as indicated.
- .3 Provide goosenecks, outlets, strainer baskets and necessary fastenings.

.7 Pitch pocket pans:
- .1 Provide pitch pocket pans and pourable sealer at all structural rod bracing roof penetrations as shown on Contract Drawings.
- .2 Form pitch pocket pans from prefinished galvanized steel sheet metal with 150 mm high upstand above finished roof and continuous flanges with no open corners. Solder joints.
- .3 Make pans minimum 50 mm wider than member passing through roof membrane.
- .4 Pans to receive specified pourable sealer.

.8 Scuppers:
- .1 Form scuppers from Type 316 stainless steel.
- .2 Sizes and profiles as indicated.
- .3 Provide necessary fastenings.

.9 Column flashings (integrated into parapet cap flashing):
- .1 Form intended 100 mm high column flashings from prefinished galvanized steel sheet metal in accordance with CRCA requirements and with splice joint method.
- .2 Sizes and profiles as indicated.
- .3 Provide necessary fastenings.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

.1 Install coping flashings, curb counter flashings, starter strips, pitch pocket pans, scuppers, gutters, downspouts and miscellaneous flashings to details shown on the Contract Drawings and in accordance with CRCA, reviewed shop drawings and to meet wind uplift resistance of the Project.

.2 Use concealed fasteners. Exposed fasteners such as pop rivets are not allowed.

.3 Install continuous starter strips to present a true, non-waving, leading edge. Anchor to back-up for a rigid, secure installation.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips.

.5 S lock joint method (typical): Make end joints using an S lock joint. Execute by inserting end coping length in 25 mm deep S lock formed in end of adjacent length. Extend concealed portion of S lock 25 mm outwards and nail to substrate. Face nailing of joints will not be permitted.

.6 Splice joint method (parapet cap and penetrating column junctures):
- .1 Make intended column flashings with splice joint in accordance with CRCA requirements.
- .2 Make end joints using a splice joint complete with sealed joint to create a watertight assembly.

.7 Seal where necessary to form weathertight seal between flashing and adjoining surfaces and between flashing and other work. Sealing work consists of bedding between members where possible. Tool sealant to concave profile where exposed. Install sealant in accordance with ASTM C1193.

.8 Insert metal flashing under cap flashing to form weathertight junction.

.9 Caulk flashing at cap flashing with sealant.

.10 Pitch pocket pans and pourable sealer:
- .1 Install pitch pocket pans, where shown around items projecting through roof membrane to CRCA requirements.
- .2 Fill pans with pourable sealer in accordance with manufacturer's written instructions and to provide a watertight seal at intended roof penetrations.

.11 Gutters, scuppers and downspouts:
- .1 Fabricate and install gutters, scuppers and downspouts in accordance with Contract Drawings, reviewed shop drawing and manufacturer's written instructions. Seal joints watertight.
- .2 Longitudinal joints not acceptable.
- .3 Line gutters and scuppers with fully adhered EPDM. Ensure gutters and scuppers are water tight.
- .4 Provide membrane around entire perimeter of scupper and bring membrane into downspout to limit risk of water and ice entering wall.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for spray applied fireproofing work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM E814, Methods of Fire Tests of Through-Penetration Fire Stops.

.2 CAN/ULC S101, Standard Methods of Fire Endurance Test of Building Construction and Materials.

.3 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.4 Technical Manual 2-A, Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials by Association of the Wall and Ceiling Industry (AWCI).

.5 UL 1479, Standard Method of Fire Tests of Through-Penetrations.

1.3 **DESIGN REQUIREMENTS**

.1 Design fireproofing for structural members, floor/ceiling assemblies, and floor/roof assemblies as unrestrained unless otherwise specifically noted as restrained on the structural drawings.

1.4 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Certification:
- .1 Submit certified documentation for each worker performing Work of this Section, to substantiate 5 years minimum of experience in sprayed fireproofing installation.
- .2 Submit installer's and Product manufacturer's certification verifying compliance with Contract Documents.
- .3 For assemblies not tested and rated in accordance with CAN/ULC S101 and CAN/ULC S102, submit proposals based on related designs using accepted fireproofing design criteria.
- .4 Submit manufacturer's inspection reports and verification/certification that work has been correctly installed.

1.5 **QUALITY ASSURANCE**

.1 Qualifications: Execute work of this Section by manufacturer-approved, skilled, qualified, and experienced workers, trained in installation of work of this Section.

.2 Regulatory Requirements: Be responsible for securing approval of materials and installation of work from authority having jurisdiction:
- .1 Perform work in compliance with ULC or cUL listed designs for the required fire resistance ratings.
- .2 Submit signed engineering proposals to Authority having Jurisdiction for acceptance if there are no listed designs that match project conditions.
- .3 Perform tests required by Authorities having Jurisdiction.

.3 Manufacturer's Site Inspection: Manufacturer's technical representative shall inspect work at suitable intervals during application and at conclusion of work of this Section, to ensure work is correctly installed.

.4 Mock-up:
- .1 Construct one 1 m^2 mock-up of fireproofing in location acceptable to Consultant.
- .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
- .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.6 **SITE CONDITIONS**

.1 Maintain a 5^0C air and substrate temperature for 24 hours before, during, and 24 hours after application in accordance with manufacturer's instructions.

.2 Ventilate to dry fireproofing. In enclosed areas circulate interior air and exhaust to the exterior.

.3 Protect adjacent surfaces and equipment around application areas from overspray, marring or damage. Clean, polish or replace materials damaged to acceptance of Consultant.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, primers, adhesives, paints, and sealers are to have low VOC content limits.

.2 Primer: As recommended by spray fireproofing manufacturer.

.3 Spray fireproofing: CAN/ULC S101, Spray applied, cementitious fireproofing with a minimum density of 240 kg/m3:
.1 'Blaze-Shield II' by Cafco Industries Ltd.
.2 'Southwest Type 5GP' by A/D Fire Protection Systems Inc.

.4 Sealer: Latex based emulsion:
.1 'Bond-Seal' by Cafco Industries Ltd
.2 'A/D Sealer' by A/D Fire Protection Systems Inc

.5 Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire resistance designs acceptable to Authority having Jurisdiction and fire resistive material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.

.6 Water: Clean, free from organic and mineral impurities which would be harmful to application.

2.2 **MIXING**

.1 Mix Products in accordance with manufacturer's instructions.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Verify that substrates are compatible and have suitable bonding characteristics to receive fireproofing.

.3 Ensure written confirmation is received from steel fabricators of the specific surface preparation procedures and primers used to ascertain compatibility with work of this Section.

.4 Ensure that items required to penetrate fireproofing are placed before installation of fireproofing.

.5 Ensure that ducts, piping, equipments, or other items which would interfere with application of fireproofing are not positioned until fireproofing is completed.

3.2 **PREPARATION**

.1 Prime substrates where required by ULC or by sprayed fireproofing material manufacturer, unless compatible shop primer has been applied and is in satisfactory condition to receive work.

.2 Clean surfaces of steel members free of dust, dirt, oil, grease, loose paint, mill scale, rust and other foreign matter in accordance with manufacturers written instructions which would interfere with bond of fireproofing. Steel to receive fireproofing should have no primers or coatings applied to the surface prior to application.

.3 Install metal lath where required to comply with fire resistance ratings and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by sprayed fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.

.4 Coat substrates with bonding adhesive where required to achieve fire resistance rating or as recommended in writing by spray fireproofing manufacturer for material and application indicated.

.5 Use temporary enclosures to prevent spray from contaminating air beyond application area.

.6 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of fireproofing material.

.7 Protect wood deck, walls, windows, floors and other surfaces around areas to be fireproofed, from marring, damage and/or overspray.

3.3 **APPLICATION**

.1 Apply fireproofing in separate coats in accordance with the manufacturer's written instructions to total thickness required to achieve fire ratings shown on the Contract Drawings. Comply with accepted ULC or Intertek Testing Services design.

.2 Apply fireproofing on steel over 2000 mm long as indicated or as required by authorities having jurisdiction.

.3 Maintain continuity of fireproofing without gaps or voids.

.4 Water tamping: Provide low pressure spray to finished surface of fireproofing to provide dense, medium smooth surface.

.5 Apply sealer to surfaces of fireproofing in accordance with the manufacturer's instructions after tamping.

.6 Repair fireproofing damaged by other trades, to acceptance of Consultant.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing to be performed by a third party inspection and testing agency handled by a cash allowance specified in Division 1.

.2 Tests to be carried out as outlined in Technical Manual 12-A by AWCI and UL 1479 and to meet requirements of authorities having jurisdiction.

3.5 CLEANING UP

.1 Clean exposed wall, ceiling or other surfaces of fireproofing materials to the acceptance of Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for firestopping and smoke seals work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block and Board–Type Thermal Insulation.

.2 ASTM C920, Standard Specification for Elastomeric Joint Sealants.

.3 ASTM C1104, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

.4 ASTM E814, Test Method for Fire Tests of Through-Penetration Fire Stops.

.5 ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops.

.6 ASTM G21, Standard Test for Determining Resistance of Synthetic Polymeric Materials to Fungi.

.7 CAN/CGSB 19.13, Sealing Compound, One Component, Elastomeric, Chemical Curing.

.8 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

.9 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.10 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.

.11 CAN/ULC S129, Standard Method Of Test For Smoulder Resistance Of Insulation (Basket Method).

.12 CAN/ULC S702, Thermal Insulation, Mineral Fibre for Buildings.

1.3 **DEFINITIONS**

.1 Fire Separation: A construction assembly, plane or device, either vertical or horizontal, which is required to prevent the passage of fire and smoke for a prescribed period of time. Proof of compliance to required time rating shall be by ULC, Warnock Hersey (or similar approved) certification or shall be as listed in the Ontario Building Code Supplementary Standard SB-2.

.2 Smoke Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time but is required to prevent the passage of smoke. A "Smoke Separation" is also known as a "Fire Separation with No Rating" or a "Zero Hour Rated Separation".

.3 Non-Rated Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time and is not required to prevent the passage of smoke.

1.4 SYSTEM DESCRIPTION

.1 Firestopping and smoke seals: ULC or Intertek Testing Services listed Products and systems in accordance with CAN/ULC S115 suitable to actual application and installation conditions.

.2 Firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.

.3 Firestop and smoke seal system shall achieve a fire resistance rating and smoke seal rating equal to that of assemblies into which they are installed.

.4 Provide smoke sealants over firestopping materials or combination smoke seal/firestop seal material to form air tight barriers to retard the passage of gas and smoke.

.5 Firestopping and smoke seals located at movement joints shall be designed with movement capability.

.6 Provide penetration firestopping with mould and mildew resistance rating of 0 in accordance with ASTM G21.

.7 Firestopping and smoke seals within mechanical and electrical assemblies shall be provided as part of the work of Divisions 21, 22, 23, 26, 27, and 28 respectively.

1.5 SUBMITTALS

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate cUL or ULC reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.
  - .3 Submit firestop and smoke seal manufacturer's Product data for materials and prefabricated devices, including manufacturer's printed installation instructions.

.2 Shop drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 indicating:
.1 Fire rated and smoke sealed systems for each typical application.
.2 Construction details, accurately reflecting actual job conditions.
.3 ULC or Intertek Testing assembly listing.
.4 Each floor and wall assembly requiring firestop system with each corresponding ULC firestop system.

.3 Certification:
.1 Submit certified documentation from manufacturer for each worker performing work of this Section.
.2 Submit installer's and Product manufacturer's certification verifying compliance with the Contract Documents and conformance with ASTM E814 and CAN/ULC S115.

1.6 QUALITY ASSURANCE

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of firestopping and smoke seal work of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator’s current certificate of approval by the material manufacturer as proof of compliance.

.2 Manufacturer's direct representative and/or fire protection specialist shall be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures conforming to manufacturer's written recommendations published in their literature and drawing details.

.3 Pre-construction meetings: Arrange with manufacturer's representative, Contractor, Consultant and Field Engineer to determine responsibility for handling such issues as FT rated partitions, firestop custom details, compatibility, mixed penetrations, and to review installation procedures 48 hours in advance of installation.

1.7 DELIVERY STORAGE AND HANDLING

.1 Deliver materials to Place of Work in manufacturer’s unopened containers, containing classification label with labels intact and legible at time of use.

.2 Do not use damaged or adulterated materials exceeding their expiry date.

1.8 SITE CONDITIONS

.1 Conform to manufacturer's requirements and maintain a minimum temperature of 5^0 C for a minimum period of 24 h before application, during, and until application is fully cured.

.2 Maintain sealant at a minimum 18° C for best workability.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 Acceptable manufacturers of rated systems include:
- .1 AD Fire Protection Systems Inc.
- .2 Hilti Canada Corporation.
- .3 3M Canada Inc.
- .4 Tremco Ltd.

2.2 **GENERAL SYSTEM REQUIREMENTS**

.1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Do not use Products containing asbestos.

.3 Firestopping components shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.

.4 Provide smoke seal sealant in following colours:
- .1 Grey or white in finished areas.
- .2 Red in unfinished areas.

.5 Smoke sealant for overhead and vertical joints for floor to be self-levelling and non-sagging sealant.

.6 Smoke sealant at vertical through penetrations in areas with floor drains shall be waterproof type.

2.3 **MATERIALS**

.1 Following materials have been provided for convenience. Contractor shall provide complete system with all components and accessories as required for fire resistant and smoke seal installation.

.2 Firestop sealant: single component, low modulus, silicone rubber, moisture curing sealant to ASTM C920, ULC labelled to CAN/ULC S115.

.3 Pre-Installed firestop devices for use with non-combustible and combustible pipes, conduit and/or cable bundles penetrating concrete floors and walls.
- .1 Cast-in place firestop device complete with aerator adaptor when used in conjunction with aerator system. Model CP 680-P by Hilti or approved alternative.
- .2 Cast-in place firestop device for use with noncombustible penetrants. Model CP 680-M by Hilti or approved alternative.
- .3 Speed sleeve for use with cable penetrations. Model CP 653 by Hilti or approved alternative.
- .4 Firestop block. Model CFS-BL by Hilti or approved alternative.

.4 Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating walls:
- .1 Speed sleeve with integrated smoke seal fabric membrane. Model CP 653 by Hilti or approved alternative.
- .2 Firestop Sleeve. Model CFS-SL SK by Hilti or approved alternative.
- .3 Retrofit sleeve for use with existing cable bundles. Model CFS-SL RK by Hilti or approved alternative.
- .4 Gangplate for use with multiple cable management devices. Model CFS-SL GP by Hilti or approved alternative.
- .5 Gangplate Cap for use at blank openings in gangplate for future penetrations. Model CFS-SL GP CAP by Hilti or approved alternative.

.5 Firestop insulation: to CAN/ULC S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application.
- .1 Density: Minimum 64 kg/m^3 when tested to ASTM C303.
- .2 Combustibility: Noncombustible to CAN/ULC S114.
- .3 Melt temperature: >1175 degrees C.
- .4 Surface burning characteristics: to CAN/ULC S102, maximum flame spread of 0, smoke developed of 0.
- .5 Moisture Absorption: 0.04 percent when tested to ASTM C1104.
- .6 Smoulder Resistance: 0.01 percent when tested to CAN/ULC S129.

.6 Damming, back-up, supports, and anchorage: In accordance with manufacturer's fire rated systems and to acceptance of authorities having jurisdiction.

.7 Primer: As recommended by firestopping sealant manufacturer.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Verify that substrates and surfaces to receive firestopping and smoke seals are clean, dry, and frost free.

3.2 PREPARATION

.1 Prepare, modify, and adjust void sizes, proportions, and conditions to conform to fire rated and smoke sealed assembly requirements such as assembly opening size and dimensional restrictions.

.2 Clean surfaces to remove material detrimental to bond including dust, paint, rust, oil, grease, moisture, frost and other foreign matter to manufacturers recommendations.

.3 Mask adjacent surfaces to avoid spillage and over-coating of adjacent surfaces. Remove stains from adjacent surfaces.

3.3 INSTALLATION

.1 Install firestopping and smoke seal systems in accordance with reviewed Shop Drawings, manufacturer's instructions and fire rated assembly to establish continuity and integrity of fire separations.

.2 Install firestop insulation in compacted thicknesses required by ULC design. Compress insulation approximately 50 percent.

.3 Install primers as recommended by firestop and smoke seal Product manufacturers.

.4 Install temporary forming, damming, back-up as required, remove after materials have achieved initial cure and will resist displacement.

.5 Install firestop and smoke seal filler in horizontal joints providing 25% compression fit.

.6 Use resilient, elastomeric firestopping and smoke seal systems in following locations:
- .1 Openings and sleeves for future use.
- .2 Penetration systems subject to vibration or thermal movement.
- .3 Penetration systems in acoustical containment enclosures.

.7 Trowel and tool exposed firestop and smoke seal. Product surfaces to uniform, smooth finish.

.8 Seal joints to ensure an air and water resistant seal capable of withstanding compressions and extensions due to thermal wind or seismic joint movement.

.9 Taped joints will not be acceptable.

.10 Repair damaged firestopped and smoke sealed surfaces to acceptance of Consultant.

.11 Identify each firestop and smoke seal penetration assembly with permanent label listing following:
- .1 Assembly and rating in hours.
- .2 Date of installation.
- .3 Installing company's name and telephone number.

.12 Do not cover materials until full cure has taken place.

3.4 INSPECTION AND TESTING

.1 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E2174 to ensure that firestopping and smoke seals have been installed in accordance with Contract documents and to tested and listed firestop system.

3.5 CLEAN-UP

.1 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

.2 Remove excess materials and debris immediately after application.

3.6 SCHEDULE OF FIRESTOP AND SMOKE SEAL LOCATIONS

.1 Following firestop and smoke seal location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of work of this Section. Generally provide systems with required fire and smoke ratings at following locations:

.1 Gaps at intersections of fire-resistance rated walls and partitions.
.2 Control and sway joints in fire-resistance rated walls and partitions.
.3 Gaps at top of fire-resistance rated partitions and walls.
.4 Penetrations through fire-resistance rated walls and partitions including mechanical and electrical services and openings and sleeves for future use.
.5 Penetrations through fire-resistance rated floor slabs, ceilings, and roofs.
.6 Gaps at edge of floor slabs at exterior walls.
.7 Perimeter of retaining angles on rigid ducts greater than 0.012 m^2, firestopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.
.8 Where indicated on drawings.
.9 At non-rated assemblies that require a smoke seal.
.10 Where required by Ontario Building Code.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for sealant work in accordance with the Contract Documents.

.2 Work of this Section does not include sealants in firestopping and smoke sealed assemblies.

.3 Work of this Section does not include sealant work identified in individual specification sections.

1.2 **REFERENCES**

.1 ASTM C834, Specification for Latex Sealants.

.2 ASTM C920, Specification for Elastomeric Joint Sealants.

.3 ASTM C1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

1.3 **SUBMITTALS**

.1 Product data: Submit copies of Product data in accordance with Section 01 33 00 describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.

.2 Samples:
- .1 Submit following samples in accordance with Section 01 33 00:
  - .1 Two samples of sealant/caulking, for colour selection.
  - .2 Two samples of back-up material and primer for physical characteristics.

.3 Certificates: Submit pull test reports for testing of each type of substrate and joint on site conducted during mock-up review.

1.4 **QUALITY ASSURANCE**

.1 Qualifications: Work of this Section shall be executed by trained applicators approved by sealant manufacturer and having a minimum of 5 years proven experience.

.2 Mock-up:
- .1 Construct one 1200 mm long mock-up of each sealant type in location acceptable to Consultant.
- .2 Demonstrate colours, joint preparation, sealant application and tooling.
- .3 Sealant manufacturer to complete pull testing of mock-up for each type of substrate and joint on site and submit corresponding pull test reports to the Consultant.
- .4 Arrange for Consultant's review and acceptance.

.5 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

.6 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.5 **SITE CONDITIONS**

.1 Do not install materials when ambient air temperature is less than 5 °C, when recesses are wet or damp, or to manufacturer's recommendations.

1.6 **DELIVERY, STORAGE AND HANDLING**

.1 Arrange delivery of materials in original, unopened packages with labels intact, including batch number, and ensure that on-site storage is kept to a minimum. Do not store materials on site where there exists any danger of damage from moisture, direct sunlight, freezing and other contaminants.

2 Products

2.1 **MATERIALS**

.1 General:

.1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.

.2 Sealant **Type A**: ASTM C920, Type S, Grade NS, Class 25; One-part, non-sag type, silicone sealant, in standard colours selected.

.1 ‘Dowsil CWS’ by Dow Consumer Solutions.

.2 ‘Sikasil 305CN' by Sika.

.3 ‘Tremsil 400' by Tremco.

.3 Sealant **Type B**: ASTM C920, Type S, Grade NS; One-part mildew-resistant silicone, in standard colours selected.

.1 ‘Dowsil 786 Mildew Resistant Silicone Sealant’ by Dow Consumer Solutions.

.2 ‘Sikasil GP Mildew Resistant' by Sika.

.3 ‘Tremsil 200 Silicone Sealant’ by Tremco Ltd.

.4 Sealant **Type C**: ASTM C834; Pure acrylic siliconized sealant; in standard white colour (paintable) as typical. Provide clear sealant for flash cove cap application.

.1 ‘950A Siliconized Acrylic Latex Caulk’ by Sherwin Williams.

.2 ‘Tremflex 834 Silconized Sealant’ by Tremco Ltd.

.5 Acoustic sealant: In accordance with Section 09 21 16.

2.2 **ACCESSORIES**

.1 Primers: Type recommended by material manufacturers for various substrates, primers to prevent staining of adjacent surfaces encountered on project.

.2 Joint backing: ASTM C1330; Round, solid section, closed cell, skinned surface, soft polyethylene foam gasket stock, compatible with primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.

.3 Bond breaker: Type recommended by material manufacturers.

.4 Void filler around the window frames to be one part expanding polyurethane foam.

.5 Cleaning agents: As recommended by material manufacturer, non-staining, harmless to substrates and adjacent finished surfaces.

2.3 **MIXING**

.1 Follow manufacturers instructions on mixing, shelf and pot life.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

.1 Protect adjacent exposed surfaces to prevent smearing, staining or other damage, by masking or other means, prior to performing work. Make good any damage caused by sealant application. Remove protection upon completion and clean adjacent, exposed surfaces of any compound deposited upon such surfaces.

.2 Prepare joints to receive sealants to manufacturer's instructions. Ensure that joints are clean and dry and ferrous surfaces are free from rust and oil.

.3 Clean recesses to receive sealant, to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance.
- .1 Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sand blasting.
- .2 Ensure recess is dry.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings. Remove incompatible coatings as required.

.4 Ensure that all materials in contact with sealant are compatible. Test substrate for adhesion.

.5 Depth of recess: Maintain depth to ½ joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.

.6 Install polyethylene backing rod in joints 6 mm or more in width. Roll backing rod into joint. Do not stretch or bend backing rod. Install bond breaker to back of recess.

.7 Prime sides of recess, in accordance with sealant manufacturer's instructions.

.8 Condition products for use in accordance with manufacturer’s recommendations.

3.3 **INSTALLATION**

.1 Apply sealant immediately after adjoining work is in condition to receive such work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to evenly fill joint.

.2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool sealant to smooth surface, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains or other defects.

.1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.

.2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.

.3 Make sealant bead uniform in colour.

.4 Cure sealants in accordance with sealant manufacturer's instructions. Do not cover up sealants until proper curing has taken place.

.5 Immediately remove excess compound or droppings which would set up or become difficult to remove from adjacent finished surfaces, using recommended cleaners, as work progresses. Do not use scrapers, chemicals or other tools which could damage finished surfaces. Remove defective sealant.

.6 Clean recesses and re-apply sealant.

.7 Remove masking tape immediately after joints have been sealed and tooled.

3.4 **CLEANING**

.1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.5 SCHEDULE OF LOCATIONS

.1 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of work of this Section. Generally seal following locations:
- .1 Concrete, masonry, wood and stone to metal.
- .2 Wood to masonry, concrete and stone.
- .3 Metal to metal.
- .4 All dissimilar materials.
- .5 Where ‘sealant’ or ‘caulking’ are indicated on drawings.

.2 Sealant **Type A**:
- .1 Exterior joints between masonry and steel or aluminum.
- .2 Exterior joints between masonry and shelf angle.
- .3 Exterior joints between steel or aluminum and concrete or masonry.
- .4 Interior and exterior control joints, except in floors.
- .5 Door frames, louvre frames, interior and exterior side.
- .6 Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.
- .7 Seal thresholds.

.3 Sealant **Type B:**
- .1 Control joints in tiled areas.
- .2 Between vanity and tile.
- .3 Between vanity and mechanical fixtures/fittings.
- .4 Between access panels and tile.
- .5 Between tiles and adjacent materials.

.4 Sealant **Type C:**
- .1 Perimeter of millwork counters.
- .2 Perimeter of interior windows.
- .3 Perimeter of firehose cabinets.
- .4 Junction between drywall and masonry.
- .5 Continuous clear sealant at juncture of flash cove cap and wainscot panels as shown.

.5 Acoustic sealant: Acoustic sealant shall be in accordance with Section 09 21 16.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for the metal doors and frames work in accordance with the Contract Documents.

1.2 **REFERENCES**

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

.2 ASTM A568/A568M, Specification for General Requirements for Steel, Carbon and High-Strength Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet.

.3 CAN4/ULC-S104M, Standard Method for Fire Test of Door Assemblies.

.4 CAN4/ULC-S105M, Standard Specification for Fire Door Frames, Meeting the Performance Required by CAN4/ULC-S104M.

.5 CAN/CGSB-1.198, Cementitious Primer, (for Galvanized Surfaces).

.6 CGSB 41-GP-19Ma, Rigid Vinyl Extrusions for Windows and Doors.

.7 CAN/ULC-S702, Thermal Insulation, Mineral Fibre for Buildings.

.8 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.9 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.10 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

1.3 **DESIGN REQUIREMENTS**

.1 Design exterior frame assemblies to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

1.4 **SUBMITTALS**

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating door and frame construction.

.2 Shop drawings:
  .1 Submit shop drawings in accordance with Section 01 33 00 for each type of door and frame indicating:
    .1 Thickness and type of steel.
    .2 Thickness and type of core.
    .3 Thickness and type of steel stiffeners and location of them within the door.

.4 Thickness and type of metal facing on edges of door and method of fastening.
.5 Location of mortises, reinforcement, anchorages, joining, welding, sleeving, exposed fasteners, openings and arrangement for hardware.

.2 Include schedule identifying each unit with door marks and numbers relating to numbering on Contract Drawings and in door schedule. Indicate doors and frames to be fire rated.

1.5 **QUALITY ASSURANCE**

.1 Perform work in accordance with requirements by a member of the Canadian Steel Door and Frame Manufacturers Association.

.2 Label and list fire rated doors and frames by an organization acceptable to authorities having jurisdiction and accredited by the Standards Council of Canada in conformance with CAN4/ULC-S104M and CAN4/ULC-S105M for ratings indicated, Labelling shall be in accordance with NFPA 80.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 Daybar Industries Limited.

.2 Fleming Doors Products.

.3 Steel-Craft Door Products Ltd.

2.2 **MATERIALS**

.1 General:
.1 All materials under work of this Section, including but not limited to, primers are to have low VOC content limits.
.2 Wherever possible, metals used in work of this Section are to contain recycled content.

.2 Steel: ASTM A568/A568M, Class 1; Commercial grade steel, hot dip galvanized to ASTM A653/A653M, ZF120 galvanized coating.

.3 Minimum base steel thickness:

.1	Frames	1.6 mm
.2	Typical doors	1.6 mm
.3	Interior stiffeners	0.9 mm
.4	Lock/strike reinforcements	1.6 mm
.5	Hinge reinforcements	2.7 mm
.6	All other reinforcement	1.6 mm
.7	Top and bottom channels	1.2 mm
.8	Glazing stops	0.9 mm

.9	Guard boxes	0.9 mm
.10	Jamb spreaders	0.9 mm

.4 Top caps and thermal breaks: CGSB 41-GP-19Ma; Rigid PVC extrusions, for use at exterior doors.

.5 Primer: CAN/CGSB 1.198.

.6 Core material:
- .1 Interior doors: Mineral fibre insulation with a minimum face density of 24 kg/m^3.
- .2 Exterior doors: Rigid poly/isocyanurate, closed cell insulation, 32 kg/m^3, thermal value: RSI 1.9.
- .3 Fire rated doors: Mineral fibre insulation to CAN/ULC S702, Type 1A; 24 kg/m^3.

.7 Screws: Paintable Robertson type steel screws with countersunk flat head.

.8 Door silencers: Type 6-180, black neoprene.

.9 Frame anchors:
- .1 Frames in masonry: 1.2 mm minimum, adjustable T-strap jamb anchors.
- .2 Frames in steel stud partitions: 0.9 mm minimum steel anchors of suitable design securely welded inside each jamb.
- .3 Labeled frames: In accordance with ULC requirements.

.10 Floor anchors: 1.6 mm minimum adjustable floor clip angles with 2 holes for anchorage to floor.

.11 Labels for fire doors and door frame: Brass plate, riveted to door and door frame.

.12 Grilles:
- .1 Corrosion resistant steel with prime coat finish. Model 61DG Series by Nailor Industries Inc or approved alternative by Hart and Cooley or approved alternative manufacturer.
- .2 Grilles to be field painted in accordance with Section 09 91 00 to match door finish.

.13 Glass and glazing: In accordance with Section 08 80 00.

.14 Insulating sealant tape: Self-adhering, open-cell polyurethane foam impregnated with a water-based acrylic impregnation, insulating perimeter tape, ‘MST’ by Emseal or approved alternative by Tremco.

2.3 FABRICATION

.1 General
- .1 Fabricate doors and frames in accordance with reviewed shop drawings.
- .2 Exterior hollow metal doors and frames shall be thermally broken.
- .3 Welding: CSA W59-M to produce a finished unit with no visible seams or joints, square, true and free of distortion.

.4 Welding: Continuous unless specified otherwise. Execute welding by a firm fully acceptable to the Canadian Welding Bureau to requirements of CSA W47.1.
.5 Form profiles accurately to details shown on Contract Drawings.
.6 Ream and remove burrs from drilled and punched holes.
.7 Grind welded corners and joints to a flat plane and fill with metallic filler and sand to a uniform smooth finish. Apply one coat of primer.
.8 Provide weather strip for exterior doors in accordance with Section 08 70 00 and door manufacturer.
.9 Unless otherwise indicated, overall door thickness to be 45 mm.

.2 Frames, windows, and screens:
.1 Fabricate frames of welded construction. Cut mitres and joints accurately and weld continuously on inside of frame profile. Exterior frames to be thermally broken.
.2 Frames to have reveal profile as indicated on Contract Drawings.
.3 Construct large frame sections with provision for on Site assembly to suit Site conditions.
.4 Blank, reinforce, drill and tap frames for mortised, templated hardware. Protect mortised cut-outs with guard boxes.
.5 Reinforce frames where required for surface mounted hardware.
.6 Reinforce frames over 1200 mm wide with roll formed steel channels or hollow structural sections specified in Section 05 50 00 and as indicated on drawings.
.7 Furnish exterior door frames with a continuously welded integral steel weather drip at head of frame.
.8 Prepare each door opening for single stud rubber door silencers, 3 for single door openings located in strike jamb, and 2 for double door openings located in head.
.9 Install 2 channel or angle spreaders per frame, to ensure correct frame alignment. Install stiffener plates or spreaders between frame trim where required, to prevent bending of trim and to maintain alignment when setting in place.
.10 Form channel glazing stops minimum 16 mm height, accurately cut, mitred, fitted and fastened to frame sections with paintable steel counter-sunk, flat head Robertson screws spaced at maximum 450 mm throughout and 50 mm from each end. Screws to be painted to match frame.
.11 Glazing to be provided on room side of screen, unless otherwise indicated.

.3 Anchorage:
.1 Anchor units to floor and wall construction. Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb, minimum number of anchors for each jamb:
.1 Frames up to 2285 mm 3 anchors.
.2 Frames from 2285 mm to 2440 mm 4 anchors.
.2 Where frames are to be set in masonry or concrete, supply adjustable anchors to trade installing frame.
.3 Fabricate frames for installation in steel stud partitions with steel anchors of suitable design, minimum number of anchors for each jamb :
.1 Frames up to 2285 mm height 4 anchors.
.2 Frames 2285 mm to 2440 mm 5 anchors.

.4 General Door Requirements:
- .1 Hollow steel construction, flush swing type, of sizes to conform to details, schedules and reviewed shop drawings with provisions for cut-outs for glass and grilles and reinforced to receive hardware fastenings.
- .2 Blank, reinforce, drill and tap doors for mortised, templated hardware. Where required, reinforce doors for surface mounted hardware and door closers.
- .3 Reinforce oversized doors with steel channels and plates specified in Section 05 50 00 and as indicated on drawings.
- .4 Where openings are required, form integral cut-outs with framing, glass stop moldings and division bars.
- .5 Install grilles to fit tight and secure into openings.
- .6 Bevel both stiles of single doors 1 in 16.
- .7 Reinforce doors with galvanized metal stiffeners at 150 mm o.c.

.5 Interior Doors:
- .1 Supply and install inverted, recessed, fully welded channels at top and bottom of doors.
- .2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
- .3 Fill hollow space within door and vertical stiffeners from top to bottom with mineral fibre batt insulation.

.6 Exterior Doors:
- .1 Exposed exterior doors may require resistance to water leakage. Water testing may be performed by a third party inspection and testing company retained by the Owner if required.
- .2 Supply and install inverted, recessed, fully welded channels at top and bottom of doors.
- .3 Supply and install PVC top caps for all exterior doors, sealed in place and installed to be water tight.
- .4 Exterior hollow metal doors and frames shall be thermally broken.
- .5 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
- .6 Fill hollow space within door from top to bottom with rigid polyisocyanurate insulation.

.7 Fire Rated Doors:
- .1 Supply and install inverted, recessed, spot welded channels at top and bottom of doors. Supply and install steel flush top caps on exterior doors.
- .2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.

.3 Fabricate doors to achieve fire rating as indicated on drawings and in accordance with ULC. Provide ULC label plate on door at hinged edge midway between top hinge and head of door.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **HOLLOW METAL DOOR, FRAME, WINDOW AND SCREEN INSTALLATION**

.1 Install hollow metal doors, frames, windows, and screens plumb, square, level, secure, and at correct elevation.

.2 Install doors clear of floor finishes, and with the correct rebate opening for the door installation. Install door silencers.

.3 Secure anchorages and connections to adjacent construction. Brace frames rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install wood spreaders at third points of frame rebate height to maintain frame width. Supply and install vertical supports as indicated on drawings for openings over 1200 mm in width. Remove wood spreaders after frames have been built-in.

.4 Allow for structural deflection and prevent structural loads from being transmitted to hollow metal frames.

.5 Touch-up areas where galvanized coating has been removed or damaged with primer.

.6 Fire rated doors: Install fire rated doors and frames in accordance with requirements of NFPA 80.

.7 Provide specified insulating sealant tape to seal voids between hollow metal doors and framing and adjacent construction in accordance with manufacturer’s written instructions and to prevent air infiltration.

3.3 **ADJUSTING AND CLEANING**

.1 Adjust doors for smooth and balanced door movement.

.2 Clean doors, frames and screens.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for the wood doors work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ANSI A208.1, Particleboard.

.2 Architectural Woodwork Standards (AWS) - Quality Standards for Architectural Woodwork.

.3 CSA O112 Series, Wood Adhesives.

.4 CAN4 S104-M, Standard Method for Fire Tests of Door Assemblies.

.5 CAN4 S105-M, Fire Door Frames.

.6 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

1.3 **SUBMITTALS**

.1 Shop drawings: Submit shop drawings of wood doors in accordance with Section 01 33 00 indicating detail thicknesses, core construction, veneers, finish, door sizes, quantities, fastenings and finishes.

.2 Samples: Submit the following samples in accordance with Section 01 33 00:
.1 Two minimum 300 x 300 mm door samples for each type of finish and cut-a-way corners showing construction and materials.

1.4 **QUALITY ASSURANCE**

.1 Perform work in accordance with requirements of AWS, Quality Standards for Architectural Woodwork, Premium Grade, except as indicated otherwise.

.2 Label and list fire rated doors by an organization accredited by the Standards Council of Canada in conformance with CAN4 S104-M and CAN4 S105-M for ratings indicated.

1.5 **DELIVERY, STORAGE, AND HANDLING**

.1 Deliver, store, and handle wood doors in accordance with the AWS Quality Standards amended as follows:
.1 Wrap wood doors individually in protective wrapping for shipment and Site storage.
.2 Handle wood doors carefully to prevent damage; replace damaged doors.
.3 Store doors flat on a dry, level surface. Ventilate and maintain recommended relative humidity before, during and after installation.

1.6 **EXTENDED WARRANTY**

.1 Interior flush and stile and rail wood doors:
- .1 Provide a Warranty certificate from the door manufacturer which binds the manufacturer to replace all doors found to have defects in factory workmanship or materials, or which warp more than 6mm out of plane, under normal use, for a minimum of five (5) years from the Date of Substantial Performance. Replacement doors shall bear same warranty from date of replacement.
- .2 "Replace" as used herein, does not include hanging, installation or field finishing. This work shall be performed by the Contractor for the warranty period stipulated in the General Conditions of the Contract. If doors were originally supplied factory finished, manufacturer must supply replacement doors with same finish.

2 Products

2.1 **MATERIALS**

.1 General:
- .1 All materials under work of this Section, including but not limited to, adhesives are to have low VOC content limits.
- .2 Adhesives - Urea-formaldehyde-free glues.

.2 Custom solid wood and stile and rail doors: Wood species to be Oak, stain grade, complete with custom glazing stops as per details, size, appearance and locations indicated on drawings; custom solid wood and stile and rail doors by Amberwood Doors Inc. or Madawaska Doors Inc.

.3 Wood veneer faced flush wood doors (solid core):
- .1 5 ply wood door: As manufactured by Baillargeon Doors Inc. or Lambton Doors.
- .2 Core: To ANSI A208.1, minimum density 513 kg/m^3 minimum, sanded faces, of thickness to fill void. Extruded particle board cores with voids are not permitted.
- .3 Rails:
  - .1 Top: 35 mm structural composite lumber.
  - .2 Bottom: 35 mm structural composite lumber.
- .4 Stiles
  - .1 16 mm hardwood laminated to 19 mm structural composite lumber.
  - .2 Edge detail: AWMAC No.2.
- .5 Crossbanding: Minimum 2.2 mm thick minimum wood based composite.
- .6 Door facing: Minimum 0.8 mm stain grade rift cut white Oak veneer, shop finished in accordance with requirements of Section 09 91 00.

.4 Wood veneer faced flush wood doors (fire rated):
- .1 ‘Fire Door Series’ by Baillargeon Doors Inc. or ‘Fire Door’ by Lambton Doors.
- .2 Core: Fire rated mineral core.
- .3 Internal blocking: AWMAC Option #3; Manufacturers' standard fire resistant blocking.
- .4 Rails:
  - .1 Top: 20 mm minimum.

.2 Bottom: 45 mm, 70 mm where drop seal occurs, minimum.

.5 Stiles:
- .1 Hinge: 19 mm minimum.
- .2 Lock: 19 mm minimum.

.6 Crossbanding: Minimum 2.2 mm thick HDF composite.

.7 Door facing: Minimum 0.8 mm stain grade Oak veneer field finished in accordance with Section 09 91 00.

.5 Edge finish: To match door facings.

.6 Adhesive: CSA O112 Series, Type I; Waterproof.

.7 Grilles: Corrosion resistant steel with baked enamel finish. Model 61DG Series by Nailor Industries Inc or approved alternative by Hart and Cooley or approved alternative manufacturer.

.8 Door frames:
- .1 Wood door frames, wood transoms and glazed wood screens in accordance with Section 06 20 00.
- .2 Metal door frames in accordance with Section 08 11 13.

.9 Glass and glazing: In accordance with Section 08 80 00.

2.2 FABRICATION

.1 Fabricate doors to sizes indicated on drawings. Unless otherwise indicated, overall door thickness to be 44 mm.

.2 Fabricate doors square, true, and free from distortion waves, ridges or core ghost lines. Factory machine doors for finish hardware and flooring.

.3 Fabricate doors using hot press construction technology. Bond stiles and rails to core using adhesive. Sand for uniform thickness. Laminate door facing and trim, to assembled core in hot press.

.4 Cut and bevel stile edges as follows:
- .1 Lock side: 3 mm in 50 mm.
- .2 Hinge side: 1.5 mm in 50 mm.

.5 Finish stain grade wood doors in factory and deliver to site ready for hanging. Protect from damage during delivery.

2.3 FIRE RATED DOORS

.1 Fabricate and label fire rated wood doors with plate label indicating fire protection rating as indicated on door schedule.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install doors plumb, rigid, square, clear of floor finishes, and with correct rebate opening for door installation.

.2 Conform to requirements of AWS Quality Standard, for wood door installation.

.3 Install door grilles plumb and level, where indicated.

3.3 **FIRE RATED DOORS**

.1 Install fire rated doors in accordance with the requirements of ULC and NFPA 80.

3.4 **ADJUSTING AND CLEANING**

.1 Replace the following wood doors:
- .1 Warped more than 3 mm, measured at any point on door, relative to perfectly flat surface.
- .2 Core telegraphing visible at 1500 mm distance, under final Site lighting conditions.

.2 Adjust doors for smooth and balanced door movement.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for coiling counter door work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A568/A568M, Specification for General Requirements for Steel, Carbon and High-Strength Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet.

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

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
  - .1 Elevations, sections, details, materials, operating components, dimensions, gauges, finishes and relationship to adjacent construction.
  - .2 Indicate each type of coiling counter door, arrangement of hardware, operating mechanism and required clearances.

.3 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.4 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.5 Closeout submittals:
- .1 Submit following for each Product for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23:
  - .1 Identification: Manufacturing name, type, year, and serial number.
  - .2 Performance criteria and maintenance data.
  - .3 Operating instructions and safety precautions.

1.4 **DELIVERY, STORAGE AND HANDLING**

.1 Package or crate, and brace products to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.

2 Products

2.1 **MATERIALS**

.1 Steel: ASTM A568/A568M, Class 1; Commercial grade steel, hot dip galvanized to ASTM A653/A653M, ZF075 satin coat finish.

2.2 **MANUFACTURED UNITS**

.1 Coiling counter doors:
- .1 Type: Non-Labelled, factory pre-assembled unit, ready for installation.
- .2 Curtain shall consist of interlocking, 32 mm wide flat slats of 22 ga. prime painted galvanized steel, fitted with endlocks to hold curtain in alignment.
- .3 Bottom of curtain shall be fitted with a bottom bar of single primed angle provided with a lift handle and master-keyed cylinder(s) on one or both sides. Bottom bar to have continuous foam astragal bumper to seal against counter top.
- .4 Frame shall be prime painted galvanized steel to suit wall thickness, consisting of 10 ga. jambs, head and fascia. Provide grooves formed into sides of frame for retaining curtain.
- .5 Hood shall be galvanized painted steel equipped with intermediate support where required.
- .6 Operation shall be by manual push up.
- .7 Finish: All galvanized steel shall have 0.2 mil thick baked-on prime paint and 0.6 mil baked-on polyester paint.
- .8 Acceptable products: ‘Series 650' by Overhead Door Corporation, ‘Cookson Counter Door’ by Richards Wilcox or ‘Model 500' Rolling Counter Shutter by Wayne Dalton.

2.3 **FABRICATION**

.1 Verify dimensions of existing work before commencing fabrications and report discrepancies to Consultant.

.2 Fabricate work in accordance with reviewed shop drawings.

.3 Fabricate work free from defects impairing function, appearance, strength and durability.

.4 Fabricate work with materials, and with component dimensions and gauges, reinforcing, attached anchors and fastenings of adequate strength to prevent warping, buckling, opening of joints and seams, loosening of hardware, distortion, and displacement within limits of intended and specified use.

.5 Construct counterbalance assembly consisting of torsion spring with 25% overload factor. Enclose spring in steel pipe to support door curtain and counterbalance mechanism with maximum deflection of 1/360th of opening width. Provide ball bearings at rotating points. Provide spring tension adjusting wheel, accessible for setting.

.6 Support counterbalance assembly on 5 mm minimum thickness steel plate brackets, forming end enclosures.

.7 Conceal and weld connections wherever possible.

.8 Fit joints and junctions between components tightly and in true planes.

.9 Isolate from each other dissimilar metals, and metal from masonry to prevent electrolysis.

.10 Install master-keyed lock cylinders supplied as specified in Section 08 70 00.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install coiling counter doors in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Supply information and templates required for installation of work of this Section; and assist or supervise, or both, the setting of anchorage built into the work of others.

.3 Install hangers, brackets, fastenings, track, operating hardware and fittings, and other specified equipment under manufacturer's supervision and instructions.

.4 Attach work to opening frame and building construction as suitable for door operation, and to avoid conflict with the work of others. Do not use fastenings which penetrate through walls.

3.3 **REPAIR**

.1 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at site only if approved by Consultant.

3.4 **ADJUSTING**

.1 Adjust work to provide free-running, tightly closing and properly counterbalanced operation. Ensure that installation is free from warp, twist or other distortion. Lubricate operating hardware.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, tool, equipment and services necessary for Aluminum work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 AAMA 501, Methods of Test for Exterior Walls.

.2 AAMA 501.5, Test Method for Thermal Cycling of Exterior Walls.

.3 AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels - Series: Components, Coatings and Finishes.

.4 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

.5 AAMA CW-DG-1, Aluminum Curtain Wall Design Guide Manual.

.6 AAMA/WDMA/CSA 101/I.S.2/A440, Standard Specification for Windows, Doors, and Unit Skylights.

.7 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

.8 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.9 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.10 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

.11 ASTM C920, Specification for Elastomeric Joint Sealants.

.12 ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.13 ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.14 ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

.15 ASTM E783, Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

.16 ASTM E1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

.17 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

.18 CAN/CGSB 1.108-M, Bituminous Solvent Type Paint.

.19 CAN/ULC S702, Thermal Insulation, Mineral Fibre, for Buildings.

.20 NFRC 100, Procedure for Determining Fenestration Product U-factors.

.21 NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 **DEFINITION(S)**

.1 Aluminum work: Shall mean aluminum curtainwall, windows, entrances, vestibules, doors, and framing mentioned in Part 2 of this Specification Section.

1.4 **DESIGN REQUIREMENTS**

.1 Design Aluminum work to meet requirements of AAMA CW-DG-1, ASTM E283, ASTM E330, ASTM E331, NFRC 100, NFRC 200 and to meet performance and energy requirements specified herein and as required by authorities having jurisdiction.

.2 Design Aluminum work in accordance with following Climatic Design Data for Toronto contained in the Ontario Building Code:
- .1 Design temperature: January 1%, July 2 1/2%.
- .2 Hourly wind pressures: 1 in 50 year occurrence.

.3 Design systems to meet the following performance criteria:
- .1 U-factor (centre of glass): Maximum; 0.12 BTU·in/h·ft²·°F. for all faces (North, South, East and West).
- .2 Solar heat gain coefficient (SHGC):
  - .1 Maximum (South): 0.34.
  - .2 Maximum (North, East and West): 0.20.
- .3 U-factor (overall system performance - glass and framing): 0.30 BTU·in/h·ft²·°F.

.4 Thermal cycling:
- .1 Curtain wall shall be designed and installed to provide for such expansion and contraction of component or system materials as will be caused by an exterior temperature range of -35°C to +75°C and building interior temperature range of +10°C to +29°C without causing harmful buckling, glass breakage, failure of joint seals, undue stress on fasteners, or other detrimental effects.
- .2 Test system in accordance with AAMA 501.5 and provide test results as required.

.3 One cycle shall be maintained at the design low temperature for 12 hours to allow temperatures within the test assembly to stabilize. Retesting for air leakage or water penetration shall indicate no reduction of performance or other detrimental effects.

.5 Design Aluminum work to accommodate following without producing detrimental effect:
.1 Cyclic, dynamic loading and release of loads such as wind loads.
.2 13 mm vertical deflection in supporting structure and movement of supporting structure due to live, dead load, and creep or deflections, seismic load, sway displacement and similar items.

.6 Condensation formation:
.1 The design and construction of the curtain wall system shall be performed so that no condensation shall form on interior surfaces when subjected to the specified environmental conditions. Condensation resistance shall be analyzed using methods in accordance with CSA A440.2 or NFRC guidelines to demonstrate performance.
.2 Design to prevent formation of condensate on interior side of Aluminum work framing under the following service conditions:
.1 Interior summer temperature: 21°C.
.2 Interior winter temperature: 21°C.
.3 Exterior temperature: -20°C.
.4 Interior RH: 35%.

.7 Restrict air infiltration/exfiltration, through Aluminum work in accordance with ASTM E283 at pressure differential as indicated:
.1 Curtainwalls and entrance assemblies: 0.0003 $m^3/s\ m^2$ at differential of 300 Pa.
.2 Doors (per door): 2.78 m^3/h m per linear metre of crack at differential of 75 Pa.

.8 Design and detail controlled drainage path to actively discharge water, which enters into or forms within Aluminum work, to exterior; prevent accumulation or storage of water within Aluminum work. Prevent water from entering interior when tested in accordance with ASTM E331.

.9 Design and detail air barrier, vapour retarder, and rainscreen products and assemblies into continuous and integrated Aluminum work envelope. Optimize Aluminum work design to align envelope layers and to minimize thermal bridges.

.10 Design Aluminum Work systems as required to accommodate the size and weight of triple glazed units as specified in Section 08 80 00.

.11 Design Aluminum Work structural sealant joints and transitions in accordance with Section 08 80 00.

.12 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 and 19 mm maximum for heights under 4115 mm and L/240 and 25 mm maximum for heights over 4115 mm.

.13 When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span in accordance with ASTM E330.

.14 Design anchorage inserts for installation as part of other Sections of work. Design anchorage assemblies to accommodate construction and installation tolerances.

.15 Provide all reinforcing within aluminum members as required by design and OBC to provide structurally sound assembly. In any case, mullion size shall not be increased due to provision of reinforcing.

.16 Aluminum work serving as a guard:
- .1 Design glazed aluminum assemblies to act as a guard and withstand required guard and handrail loads in accordance with OBC requirements, SB 13 and applicable local regulations.
- .2 Design aluminum work system and connections to act as a guard where the bottom of the Aluminum work extends to a point below 1070 mm above finished floor level and separates a floor level from an adjacent interconnected space.
- .3 Provide a letter signed and sealed by a Professional Engineer certifying that the Aluminum work conforms to the OBC requirements.

1.5 SUBMITTALS

.1 Shop drawings:
- .1 Submit shop drawings for mock-ups and Aluminum Work in accordance with Section 01 33 00 indicating:
  - .1 Plans, sections, details, type of extrusions, profiles, finishes, panels, spandrels, operating components, doors, related flashings, closures, fillers, and end caps, and sealants.
  - .2 Products and glazing types.
  - .3 Calculations or modelling confirming Aluminum work conforms to specified performance and energy requirements.
  - .4 Structural integrity of Aluminum work, anchorage inserts, and system installation tolerances.
  - .5 Section and hardware reinforcement, anchorage, assembly fixings.
  - .6 Detailing, locations, and allowances for movement, expansion, contraction
  - .7 Air barrier and vapour retarder continuity and path of cavity drainage and air pressure equalization.

.2 Samples:
- .1 Submit two samples of following in accordance with Section 01 33 00.
  - .1 250 mm long samples of each type of extrusion and finish.
  - .2 250 x 200 mm samples of insulating glass unit.
  - .3 One complete corner detail of door frame, glazing, and finish for each door type.
  - .4 Each operable vent hardware for Consultant’s approval.

.3 Reports:
- .1 Submit substantiating engineering data, and independent test results of pre-tested, Aluminum work to substantiate compliance with the design criteria including air leakage, water penetration and thermal cycling conforming to ASTM E283, ASTM E331 and AAMA 501.5, respectively and additional testing as per field mock-up.
- .2 Engineering data demonstrating compliance with test procedures outlined in AAMA 501 including as a minimum air leakage resistance, static pressure water penetration resistance, dynamic pressure water penetration resistance, wind load resistance, vertical live load deflection movement and lateral (horizontal) movement, and condensation resistance.
- .3 Submit documentation to substantiate ten years of experience in Aluminum work manufacture and installation of similar size and nature.

.4 Close-out submittals: Submit Aluminum work data for incorporation into the Operations and Maintenance Manual as part of Section 01 78 23.

1.6 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in Aluminum work of comparable complexity and scope to perform the following services as part of the work of this Section:
- .1 Design of Aluminum work.
- .2 Review, stamp, and sign shop drawings.
- .3 Conduct on-Site inspections and prepare and submit inspection reports. Number and frequency of inspection to be sufficient to satisfy Engineer that Window Wall Work is being fabricated and installed in accordance with reviewed shop drawings and design intent.

.2 The Consultant, third party inspection and testing agency, Commissioning Agent and/or Owner may visit the framing manufacturer’s facilities during manufacture/fabrication of products to be installed on this Project. If requested, the Contractor shall arrange for access for the Consultant to that manufacturer’s facility to examine manufacture of the products for this Project.

.3 Mock-up:
- .1 Provide one full scale in-situ mock-up in a location agreed upon with the Consultant for testing, including air leakage, water penetration and deflection in accordance with AAMA 501, ASTM E283, ASTM E330, ASTM E331, ASTM E783 and ASTM E1105.
- .2 Erect one, full scale mock-up of aluminum work assembly on site, in location acceptable to Consultant.
- .3 Demonstrate conformance to specified design requirements.
- .4 Demonstrate installation procedures, finished look and quality of workmanship including, but not limited to, framing members, glazing units, anchorage, opening units, doors and transitions to adjoining assemblies and materials.
- .5 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

.4 Pre-installation meetings:
.1 Mock-ups: Prior to installation of mock-ups, arrange meeting at the shop and on Site to be attended by Consultant, Contractor, and curtain wall Engineer and site superintendent to inspect substrates, and to review installation procedures 48 hours in advance of installation.
.2 Site: Prior to installation of curtain wall, arrange meeting at the Site to be attended by Consultant, Contractor, and curtain wall Engineer and site superintendent to inspect substrates, and to review installation procedures 2 weeks in advance of installation.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle Aluminum Work in accordance with AAMA CW-10 and manufacturer's written recommendations.

.2 Protect aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

1.8 EXTENDED WARRANTY

.1 Aluminum work: Submit an extended warranty for Aluminum work in accordance with General Conditions, except that warranty period is extended to 5 years.
.1 Warrant against failure to meet the design criteria and requirements such as interior leakage, finish degradation, frame condensation.
.2 Coverage: Labour and materials to repair or replace Aluminum Work as required to correct deficient work and meet specified requirements including affected adjacent work.

.2 Glazing:
.1 Provide a 10 year warranty, commencing from date of Substantial Performance, against defects in the insulating glass units and warrant them to be free from material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause, under normal design conditions. Warrant the following:
.1 The insulating glass units shall be free from condensation, fogging material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause under design conditions.
.2 The insulating glass units shall not change their mechanical design properties and shall not in any way deteriorate, degrade, delaminate or change their visual appearance.
.3 The glass units will not break due to thermal shock and temperature differential due to inherent glass faults, other than extrinsic glass breakage.
.4 Internal fogging shall be deemed to occur when light transmission of the glass is reduced by 5% ina any 50 mm x 50 mm area.
.5 Failure will be deemed to occur when the internal dew point exceeds -40oC in a 21oC ambient temperature (when tested in accordance with ASTM E576).

.2 Warrant that glazing work is water and weather tight and free from distortion; that glazing materials will not deteriorate from exposure to the atmosphere and weather, will not be displaced, and will be free from permanent deformation under load; and that glass and insulating glass units will not be broken, cracked or scratched by causes resulting from defects in material, workmanship or design of glazing installation.

.3 Cracked or scratched glass, shrinking, cracking, staining, hardening, sagging of glazing materials; loosening or rattling of glass; and leaking of glazed joints will be considered defective work.

.4 Warranty shall provide for the removal of defective Products, replacement with new Products conforming to the specifications, and restoration of work damaged by removal and replacement including labour and installation costs.

3. Manufacturer's finish Warranty: Provide manufacturer's written warranty naming Owner as beneficiary and covering finish degradation or failure of factory-applied exterior fluoropolymer finish on Aluminum work within the warranty period; warrant finish per AAMA 2605 for colour fade less than 5 units, maximum chalk rating of 8, and greater than 30% gloss retention. Warranty period for finish: 5 years from date Work is certified as substantially performed.

2 Products

2.1 ACCEPTABLE MANUFACTURER(S) AND SYSTEM(S)

.1 General:

.1 All Aluminum work systems and components are to be provided by a single manufacturer to ensure a single source of responsibility for the Work of this Section.

.2 Exterior aluminum work systems and framing shall be thermally broken.

.2 Curtain wall, window and entrance framing:

.1 Thermally broken, curtain wall, window and entrance framing systems with triple glazing, capped and with structural silicone glazed (SSG) mullions:

.1 ‘ThermaWall 2600 Series’ by Alumicor Limited.

.2 ‘1600UT System 1 Curtain Wall' by Kawneer Company Canada Limited.

.3 ‘Schuco FWS 60.SI’ by Schuco.

.2 Curtain wall and window systems shall be complete with compatible operable vents where shown on Contract Drawings.

.3 Vestibule framing: Non-thermally broken, single glazed vestibule framing, ‘1800 Series’ by Alumicor Limited or ‘Trifab VG 451’ by Kawneer Company Canada Limited or approved alternative by Schuco.

.4 Aluminum doors:

.1 Thermally broken, wide stile aluminum door with 150 mm stiles and top rail and 300 mm high bottom rail, ‘Insuldoor’ by Alumicor Limited, designed to accommodate triple glazed exterior doors and single glazed interior doors.

.2 Or approved alternatives by Kawneer Company Canada Limited or Schuco.

.5 Aluminum sills: Extruded aluminum sills, minimum 3 mm thick, complete with end dams, closures, by Alumicor Limited or approved alternatives by Kawneer Company Canada Limited or Schuco.

2.2 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, sealants are to have low VOC content limits.

.2 Aluminum extrusions and channels: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper.
- .1 Profile and dimensions: Refer to Contract Drawings.
- .2 Thermal breaks in frame members: Vertically aligned with glazing.

.3 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 1.29 mm for sheets less than 610 mm wide and minimum 2.05 mm for sheets of a greater dimension.

.4 Reinforcements and anchors: ASTM A167, Type 304 to AISI No. 2B finish. Size as shown.

.5 Glass, glazing materials and structural silicone glazing (SSG): As specified in Section 08 80 00.

.6 Spandrel panel airseal backpan: ASTM A653/A653M; 0.9 mm thick, Z275 galvanized steel sheet.

.7 Airseal and Aluminum work sealant: ASTM C920, Type S, Grade NS, Class 100/50; One-part, low-modulus, moisture-curing, silicone. ‘Dowsil 790' by Dow Consumer Solutions; ‘Spectrem 1' by Tremco. Verify compatibility with insulating glass unit manufacturer's secondary sealant. Colour as selected by Consultant. Primer as recommended by manufacturer.

.8 Frame sealant: Type as recommended by the Aluminum work manufacturer.

.9 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.

.10 Airseal transition membrane: ‘Sopraseal Stick 1100' by Soprema Inc., ‘Exoair 110' by Tremco or ‘Air-Shield’ by W.R. Meadows. Membrane to come complete with applicable primer. Ensure compatibility with air and vapour control layer under Section 07 27 01.

.11 Anchors, clips, and angles: Extruded aluminum or stainless steel.

.12 Shims and blocking for frame: Rigid plastic, wood is not permitted.

.13 Flashings, closures and trim: 2.0 mm minimum aluminum sheet, finish to match Aluminum Work extrusion finish. Allow for drip deflectors.

.14 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304.

.15 Isolation coating: CAN/CGSB-1.108-M; Bitumastic coating, acid and alkali resistant material.

.16 Spandrel panel insulation: CAN/ULC S702; Semi-rigid mineral fibre.
- .1 Type 703 by Owens-Corning.
- .2 CurtainRock by Rockwool Inc.
- .3 Thickness: As required to fill void.
- .4 Insulation fasteners: Stik-Clip with retaining washer.

.17 Insulating sealant tape: Self-adhering, open-cell polyurethane foam impregnated with a water-based acrylic impregnation, insulating perimeter tape, 'MST' by Emseal or approved alternative by Tremco.

.18 Operable vent hardware: Manufacturer's standard heavy duty corrosion resistant hardware.

.19 Door hardware: Supplied by finish hardware supplier under Section 08 70 00 for installation by door manufacturer.

.20 Insect screen (louvers): Extruded aluminum frames containing 14 x 18 heavy duty aluminum mesh in accordance with AAMA/WDMA/CSA 101/I.S.2/A440. Screen to be retained in place with turn clip type fixings.

.21 Weatherstripping: Manufacturer's standard weatherstripping, durable, non-absorbing material resistant to deterioration by aging and weathering.

2.3 FABRICATION

.1 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.

.2 Fabricate Aluminum work in accordance with reviewed shop drawings and manufacturer's written instructions.

.3 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Apply frame sealant at joints to provide continuity of water and air barrier.

.4 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

.5 Do not expose manufacturer's identification labels on aluminum assemblies.

.6 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing, form to profile shown. Fabricate flashings, filler and closure pieces as necessary for a complete and weather tight installation, complete with drip deflectors.

.7 Position operable windows on main frame to provide direction of opening specified, free and smooth operation, without binding or sticking against main frame members.

.8 Fabricate doors and frames complete with internal reinforcements, cut-outs, and recesses to accommodate finish hardware. Reinforce cut-outs to assure adequate strength.

.9 Fabricate Aluminum work closures and trim from aluminum sheet. Form to profile shown. Make weathertight.

.10 Double weatherstrip doors. Install weatherstripping in specially extruded ports and secure to prevent shrinkage or movement.

.11 Fabricate glazing recess with drainage to exterior.

2.4 ALUMINUM DOORS

.1 Fabricate doors of welded construction.

.2 Glazing stop: Aluminum, square, snap-on type, designed for glazing system.

2.5 INSULATED SPANDREL PANELS

.1 Fabricate insulated spandrel panel inner facing of galvanized sheet to form an airseal backpan. Wrap edges with galvanized sheet, enabling installation and minor movement of perimeter seal.

.2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

.3 Provide integral reinforcing and stiffeners as required to reinforce panel against deflection caused by wind and suction loads.

.4 Place continuous layer of insulation to airseal backpan with adhesive and impale clips and fasteners. Ensure there are not gaps between the insulation and airseal backpan.

.5 Provide spacers as necessary to separate dissimilar metals.

.6 Ventilate and pressure equalize the air space outside the exterior surface of the insulation, to the exterior.

.7 Arrange fasteners and attachments to ensure concealment from view.

.8 Glass panels: Consists of spandrel glass to the exterior with insulated backpan to the inside. Insulation shall be in thickness as indicated on Contract Drawings, retained with stick clips. Seal all joints in shop with specified sealant, including perimeter seal at backpan. Colour to later selection by Consultant.

2.6 **FINISH**

.1 Extrusion finish: 'Duranar (XL)' by PPG in accordance with AAMA 2605. Colour: To match PPG colour 'Silver UC 82989XL'.

.2 Doors: 'Duranar (XL)' by PPG in accordance with AAMA 2605. Colour: To match PPG colour 'Silver UC 82989XL'.

.3 Sheet finish: As indicated on drawings to match adjacent extrusion finish.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install Aluminum work in accordance with reviewed shop drawings, manufacturer's instructions and to meet requirements of authorities having jurisdiction.

.2 Install work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.

.3 Apply isolation coating at 0.8 mm dry film thickness to prevent corrosive or electrolytic action between dissimilar materials such as aluminum to concrete, masonry, galvanized steel and similar conditions.

.4 Install flashings, closures, and trim pieces.

.5 All open ended frames of curtain walls and windows are to be closed/capped and sealed to prevent passage of air.

.6 Provide specified insulating sealant tape along the interior edge of aluminum framing at junctures with adjacent construction to prevent air infiltration and an installation in accordance with manufacturer's written instructions.

.7 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.

.8 Refer to Contract Drawings for glazing type locations. Install glazing in accordance with Section 08 80 00.

.9 Insulated spandrel panels:
- .1 Set back pans to framing in sealant and apply sealant to cover screw heads to maintain air tight seal between back pans and framing. Backpan to terminate at side of frame not shoulder.
- .2 Adhere stick clips to metal back pans at 300 mm o.c. both ways. Apply insulation adhesive over entire surface of barrier and around clips held with adhesive.
- .3 Cut insulation slightly over-size and press insulation boards firmly to barrier impaling them on clips without bending clips. Butt insulation boards tightly. install retainers to clips.

.10 Automatic door operators to be supplied and installed by Section 08 70 00. Install doors and hardware to manufacturers' written instructions. Clean and adjust hardware for correct performance.

.11 Install aluminum door manufacturer's standard weatherstripping at door frame perimeter. Install weatherstripping throughout entire length and width of doors at jambs and heads.

.12 Install doors and hardware to manufacturers' written instructions. Clean and adjust hardware for correct performance.

.13 Adjust operable parts for correct function.

.14 Remove damaged or unacceptable Products and assemblies from Site and replace to Consultant's acceptance.

.15 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

3.3 ERECTION TOLERANCES

.1 Tolerances: Non-cumulative.
- .1 Maximum variation from plumb: 1.5 mm/3 m non-cumulative or 12 mm/30 m, whichever is less.
- .2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- .3 Vertical and horizontal positions: +/- 3 mm.
- .4 Racking of face: 6 mm, nil in elevation.
- .5 Operable components: Consistent with smooth operation and weatherproof performance.
- .6 Maximum perimeter sealant joint between Aluminum work and adjacent construction: 13 mm.

3.4 GLAZING PERIMETER AIRSEAL

.1 Install glazing perimeter airseal at entire perimeter of each insulating glass unit to achieve an airseal from insulating glass unit to curtain wall frame. Do not obstruct path of cavity drainage and air pressure equalization.

.2 Perform sealant work in accordance with manufacturer's written requirements.

3.5 **AIRSEAL TRANSITION MEMBRANE**

.1 Install primer and airseal transition membrane in accordance with manufacturer's instructions and reviewed shop drawings.

.2 Overlap airseal transition membrane 75 mm minimum and lap in direction of waterflow. Hand roll membrane to ensure 100% contact and adhesion to substrates.

.3 Coordinate airseal transition to adjacent parts of Work, such as but not limited to air and vapour control layer under Section 07 27 01. Continuity of weather and air seal to be maintained throughout window wall and at interface with adjacent components or systems.

.4 Provide terminations fabricated from same material as airseal transition membrane or material recommended by membrane manufacturer at sills, lintels, openings, and where horizontal surfaces intersect with vertical surfaces to ensure moisture is shed to exterior.

3.6 **JOINT BACKING AND ALUMINUM WORK SEALANT**

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at Aluminum work and perimeter joints for weather tight installation in accordance with sealant manufacturer's instructions. Tool sealant. Remove excess sealant.

3.7 **CLEANING**

.1 Maintain Aluminum work, inside and outside, in clean condition throughout construction period.

.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

.3 Remove certification labelling when directed by Consultant, in writing.

.4 Wash Aluminum work with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, tool, equipment and services necessary for interior aluminum sliding window work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

.2 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

.3 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

.4 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

.5 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.

.6 CAN/CGSB-12.8, Insulating Glass Units.

1.3 **DESIGN REQUIREMENTS**

.1 Design sliding glass window assembly complete with all accessories and components as required for complete and secure installation and in accordance with OBC and applicable local regulations.

1.4 **SUBMITTALS**

.1 Shop drawings:
  .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
    .1 Plans, sections, details, type of extrusions, profiles, thicknesses, seals, finishes, panels, operating components, closures, fillers, and sealants.
    .2 Products and glazing types.
    .3 Anchorage inserts, system installation tolerances.
    .4 Section and hardware reinforcement, anchorage, assembly fixings.
    .5 Detailing, locations, and allowances for movement, expansion, contraction.

.2 Samples:
  .1 Submit two samples of following in accordance with Section 01 33 00.
    .1 250 mm long samples of each type of extrusion and finish.

.3 Reports/certificates:
  .1 Submit documentation to substantiate ten years of experience in window manufacture and installation.
  .2 Submit written manufacturer’s certificate certifying compliance with the specifications.

.4 Close-out submittals: Submit data for incorporated into the Operations and Maintenance Manual as part of Section 01 78 23.

1.5 QUALITY ASSURANCE

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installations of a similar size and nature and that is approved by manufacturer. Submit to Consultant, installer's current certificate of approval by the material manufacturer as proof of compliance. Submit proof of experience upon Consultant's request.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Handle windows in accordance with AAMA CW-10.

.2 Protect surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

.3 Deliver windows crated to provide protection during transit and job storage.

.4 Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Consultant's specifications and satisfaction, damaged parts should be removed and replaced.

.5 Store windows at building site under cover in dry location.

1.7 SITE CONDITIONS

.1 Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.8 EXTENDED WARRANTY

.1 Submit extended warranty for interior sliding aluminum windows in accordance with General Conditions, except that warranty period is extended to 5 years from date of Substantial Performance of the Work.

.1 Warrant against failure to meet the design criteria and requirements.

.2 Coverage: Complete replacement including affected adjacent Work.

2 Products

2.1 ACCEPTABLE SYSTEMS AND MANUFACTURERS

.1 Interior aluminum sliding windows:
- .1 Provide lockable interior sliding window between two (2) infant rooms labelled as screen S104.3.
- .2 Operable sliding sound studio windows by Soundproof Windows Inc., or approved alternative.
- .3 Sliding windows consist of the following components and meet the below criteria:
  - .1 STC rating: 26 or better.
  - .2 Size: As indicated on Contract Drawings.
  - .3 Rollers: Steel, high quality ball bearing wheels, 32 mm in diameter.
  - .4 Sliding panels: Fabricated from aluminum and glass.
  - .5 Concealed guides: To stabilize bottom of sliding panel.
  - .6 Jambs: Aluminum, 102 mm wide.
  - .7 Glass: Tempered safety glass in insulating glass unit.
  - .8 Hardware:
    - .1 Manual pull, on interior side of manual units.
    - .2 Thumb turn locks on both sides. One thumb turn shall not disengage the opposite side.

2.2 MATERIALS

.1 General: All materials under work of this Section, including but not limited to, sealants and coatings are to have low VOC content limits.

.2 Aluminum materials:
- .1 Aluminum extrusions: ASTM B221 and ANSI H35.1 AA6063 alloy, T5 temper; frame sections minimum 3 mm thick.
- .2 Aluminum finish and colour: Manufacturer's standard powder coated finish in custom colour as selected by the Consultant.

.3 Glass and glazing materials:
- .1 Glass and glazing provided by manufacturer in thickness and type recommended for particular unit type. Contractor to coordinate acquisition of glass in thickness and type in accordance with manufacturer's recommendations for prescribed design (manufacturer to provide corresponding glass stops for field glazing).
- .2 Tempered glass: CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear.
- .3 Insulating glass units: To CAN/CGSB-12.8-M, sealed double glazed unit.

.4 Sealant: CAN/CGSB-19.13-M; Single-Component, silicone sealant; 'Spectrem 1' by Tremco or 'Dowsil 790 Silicone Building Sealant' by Dow Consumer Solutions. Colour as selected by Consultant.

.5 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.

.6 Anchors, clips, and angles: Stainless steel.

.7 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304.

2.3 **FABRICATION**

.1 Fabricate sliding windows in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.

.3 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints.

.4 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install interior sliding aluminum windows in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Install work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.

.3 Adjust operable parts for correct function.

.4 Remove damaged or unacceptable Products and assemblies from Site and replace to Consultant's acceptance.

.5 Remove, dispose of, and replace broken, cut, abraded glass, and defective glass including but not limited to production dimples, roller wave or marks, tong marks, chips, cracks, etc.

.6 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

3.3 **SEALANT WORK**

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at window work and perimeter joints for sound tight installation in accordance with sealant manufacturer's instructions. Tool sealant. Remove excess sealant.

3.4 **CLEANING**

.1 Clean window frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's written instructions. Remove excess glazing sealant compounds, dirt or other substances.

.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

3.5 **PROTECTION**

.1 Provide protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, at the time of acceptance.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, tool, equipment and services necessary for single glazed system work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

.2 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

.3 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.4 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.5 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

.6 ASTM C920, Specification for Elastomeric Joint Sealants.

.7 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

1.3 **DESIGN REQUIREMENTS**

.1 Design the entire single glazed system, including framing and supports as required.

.2 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 and 10 mm maximum regardless of span.

.3 Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies with a minimum safety factor of 2.0.

.4 Design members to withstand dead load and live loads calculated in accordance with OBC and applicable local regulations, to maximum allowable deflection of 1/360 of span.

1.4 **SUBMITTALS**

.1 Shop Drawings:
- .1 Submit Shop Drawings in accordance with Section 01 33 00 indicating:
  - .1 Plans, sections, details, type of extrusions, profiles, thicknesses, seals, finishes, panels, operating components, closures, fillers, and end caps, and sealants.
  - .2 Products and glazing types.
  - .3 Anchorage inserts, system installation tolerances.
  - .4 Section and hardware reinforcement, anchorage, assembly fixings.

.5 Detailing, locations, and allowances for movement, expansion, contraction.

.2 Samples:
.1 Submit two samples of following in accordance with Section 01 33 00.
.1 250 mm long samples of each type of extrusion and finish.
.2 250 x 200 mm samples of glass.

.3 Reports/Certificates:
.1 Submit documentation to substantiate ten years of experience in glazed partition manufacture and installation.
.2 Submit written manufacturer's certificate certifying compliance with the specifications.

.4 Close-out submittals: Submit data for incorporated into the Operations and Maintenance Manual as part of Section 01 78 23.

1.5 QUALITY ASSURANCE

.1 Retain a licensed Professional Engineer, registered in Province of Ontario, to perform following services for single glazed system work:
.1 Design of single glazed system.
.2 Review, stamp, and sign Shop Drawings.
.3 Conduct on-Site inspections and prepare and submit inspection reports.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Handle glazed partition work in accordance with AAMA CW-10.

.2 Protect surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

1.7 EXTENDED WARRANTY

.1 Submit an extended warranty for glazed partition work in accordance with General Conditions, except that warranty period is extended to 5 years.
.1 Warrant against failure to meet the design criteria and requirements.
.2 Coverage: Complete replacement including affected adjacent work.

2 Products

2.1 **ACCEPTABLE MANUFACTURER(S) AND SYSTEM(S)**

.1 Structural, butt glazed partition system:
- .1 Partitions: Aluminum 'U' channel frame with top and bottom channel, in sizes as shown,'120" U Channel' complete with roll-in gaskets by C.R. Laurence or Inkan Limited.
- .2 Glass: In accordance with Section 08 80 00 with structural silicone vertical joints.
- .3 Material: Extruded aluminum with satin anodized finish to AAMA 611.

2.2 **MATERIALS**

.1 General: All materials under work of this Section, including but not limited to, sealants and coatings are to have low VOC content limits.

.2 Aluminum extrusions and channels: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper. Profile and dimensions: Refer to Contract Drawings.

.3 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 1.29 mm for sheets less than 610 mm wide and minimum 2.05 mm for sheets of a greater dimension.

.4 Reinforcements and anchors: ASTM A167, Type 316. Size as shown.

.5 Glass and glazing materials: In accordance with Section 08 80 00.

.6 Glazing gasket: EPDM roll-in glazing gasket.

.7 Frame sealant: Type as recommended by the glazed partition work manufacturer.

.8 Glazed partition work sealant: ASTM C920; Single-Component, silicone sealant; 'Spectrem 1' by Tremco or 'Dowsil 790' by Dow Consumer Solutions. Colour as selected by Consultant.

.9 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.

.10 Anchors, clips, and angles: Stainless steel.

.11 Closures and trim: 1 mm minimum aluminum sheet, finish to glazed partition.

.12 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 316.

2.3 **FABRICATION**

.1 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.

.2 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints.

.3 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

.4 Do not expose manufacturer's identification labels on glazed partition assemblies.

.5 Fabricate filler and closure pieces as necessary for a complete installation.

.6 Fabricate glazed partition work closures and trim from aluminum sheet.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install single glazed system work in accordance with reviewed Shop Drawings and manufacturer's written instructions.

.2 Install work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.

.3 Install closures and trim pieces.

.4 Refer to Contract Drawings for glazing type locations. Install glazing in accordance with Section 08 80 00.

.5 Remove damaged or unacceptable Products and assemblies from Site and replace to Consultant's acceptance.

.6 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

3.3 **ERECTION TOLERANCES**

.1 Tolerances: Non-cumulative.
- .1 Maximum variation from plumb: 1.5 mm/3 m non-cumulative or 12 mm/30 m, whichever is less.
- .2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- .3 Vertical and horizontal positions: +/- 3 mm.
- .4 Racking of face: 6 mm, nil in elevation.

.5 Maximum perimeter sealant joint between glazed partitions and adjacent construction: 12 mm.

3.4 **JOINT BACKING AND GLAZED PARTITION WORK SEALANT**

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at glazed partition work and perimeter joints for sound tight installation in accordance with sealant manufacturer's instructions. Tool sealant. Remove excess sealant.

3.5 **CLEANING**

.1 Maintain glazed partition work, inside and outside, in clean condition throughout construction period.

.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

.3 Wash glazed partition work with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for finish hardware work in accordance with the Contract Documents.

.2 Supply only of door hardware will be handled by a cash allowance specified in Division 1.

1.2 **REFERENCES**

.1 BHMA, Builders Hardware Manufacturing Association.

.2 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

1.3 **SUBMITTALS**

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating compliance with reference standards, transportation, storage, handling and installation requirements.

.2 Shop Drawings:
- .1 Submit Shop Drawings and 3 complete hardware lists in accordance with Section 01 33 00 indicating:
  - .1 Door locations, sizes, hardware manufacturer's catalogue numbers, finish symbols and quantities required.
  - .2 Locations and mounting heights of each type of hardware.
- .2 Supply templates and required information to door and frame manufacturer to enable accurate sizes, locations of cut-outs and reinforcement for hardware.
- .3 Submit templates to required trade to arrange for provisions for accurate setting and fitting of hardware.

.3 Samples:
- .1 Submit 2 samples in accordance with Section 01 33 00 of each item that is different from hardware specified and include manufacturer's parts lists and installation instructions.
- .2 Submit hardware component samples illustrating style, colour and finish. Tag samples identifying applicable Specification article number, brand name and number, finish, building location, date and catalogue number.
- .3 Do not order hardware until samples have been accepted. Submit new samples to replace rejected samples. Supply hardware and finishes identical to each accepted sample.

.4 Closeout submittals:
.1 Submit the following in accordance with Section 01 78 23 for each Product for incorporation into Operation and Maintenance Manual:
.1 Maintenance data.
.2 Operating instructions and safety precautions.
.3 Parts list with name and address of supplier.
.4 Lubrication schedule and type of lubricant recommended.
.5 Keys, tools and special devices.
.6 Inspection procedures related to preventive maintenance.

1.4 QUALITY ASSURANCE

.1 General:
.1 Manufacturers: Companies specializing in manufacturing door hardware and registered with BHMA.
.2 Hardware supplier: Company specializing in supplying commercial door hardware and acceptable to manufacturer.

.2 Certifications:
.1 Employ an Architectural Hardware Consultant to inspect completed installation and certify that hardware has been installed in accordance with manufacturer's printed instructions, Authorities having Jurisdiction and as specified.
.2 Submit manufacturer's certificate that finish hardware and fire rated hardware meets specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Be responsible for packaging of hardware, on a set by set basis. As material is received from various manufacturers identify it to correspond to Hardware List symbols.

.2 Label packages legibly, indicating manufacturer's number, types, sizes, opening number and Hardware List reference number. Wrap hardware and include in package, screws, bolts and fastening necessary for correct installation. If hardware package is not complete, pay additional charges incurred by installer.

.3 Deliver hardware to Site packaged, labelled and cross-referenced to hardware list for each item and its scheduled installation location.

.4 Accept Products of this Section on Site and that each item is undamaged.

.5 Catalogue and store hardware in secure area.

2 Products

2.1 **GENERAL**

.1 Products, materials and finishes are to be supplied after award of Contract. No substitutions are allowed without written acceptance of Consultant.

.2 Finish hardware, general:
- .1 Hinges:
  - .1 Heavy-duty commercial grade Type 304 stainless steel, ball-bearing style.
  - .2 Type 304 stainless steel screws.
  - .3 Do not install piano-style hinges in high use applications.
- .2 Hinge guards: Install retractable, fabric type to prevent pinching at all play rooms.
- .3 Levers: Install childproof lever-style door hardware.
- .4 Door closers should be slow-release type.
- .5 Stops: Wall-mounted to prevent tripping, ensure adequate blocking.
- .6 Kickplates: Install on both door faces where required.
  - .1 Type 304 stainless steel finish.
  - .2 Install to minimum height of 200 mm.
  - .3 Install higher kickplates in stroller storage room, janitor's room.
  - .4 Install kickplates on all wood and painted doors.
- .7 Provide weather stripping on all exterior doors.
- .8 Locks/keying system: Lock and keying system shall be in accordance with Owner's requirements.
- .9 Thresholds and accessories: Exterior thresholds and sliding tracks to be aluminum or Type 304 stainless steel.

.3 Carefully check and verify Hardware List against Contract Drawings to ensure that hardware listed can be used as specified. Inform Consultant of concerns regarding quality, quantity, operation or function of hardware selected:
- .1 Verify hand of doors, examine details on Contract Drawings and at Site to ensure hardware supplied can be correctly installed and is correct for work as constructed.
- .2 Select hardware in accordance with applicable codes and regulations and to approval of local Fire Marshal.
- .3 Replace and pay for defective hardware including hardware which was incorrectly selected, and remedial and installation costs.

.4 Ensure that hardware selected will function correctly, meets Contract requirements and Authorities having Jurisdiction.

.5 Ensure that each hardware item is of same type, design and by same manufacturer.

.6 Manufacturer's names or trade marks are not permitted on exposed surfaces of hardware.

.7 Include in packing slip a list of parts, name of supplier and door number in which lock is to be installed.

.8 Hardware for fire rated and labelled door and frame assemblies: ULC listed or as accepted by authorities having jurisdiction.

.9 Fire rated assemblies:
- .1 Hardware: Selected and installed in accordance with applicable codes and regulations, NFPA-80 and to approval of Ontario Fire Marshal.
- .2 Fire rated doors: ULC labelled hardware. Submit written certification of conformance to ULC requirements for each type of hardware prior to delivery.
- .3 Locksets and latchsets on fire rated doors: 19 mm throw minimum.

2.2 ACCESSORIES

.1 Items to be attached to masonry or concrete with expandable shields, lag screws, bolts or other fastening devices as required. Exposed screws: Stainless steel, Phillips or Robertson heads.

2.3 FINISHES

.1 Metal finishes: Free from defects, clean, unstained and of a uniform colour for each type of finish required. Exposed surfaces and anchors: Specified finish symbol of item.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

.1 Install hardware in accordance with reviewed Shop Drawings, manufacturer's installation instructions, and applicable Codes and regulations.

.2 Install hardware in accordance with hardware templates.

.3 Adjust fixed and operable hardware for correct clearances and function.

.4 Mount hardware measured from finished floor to centre of hardware, unless indicated otherwise or required by Code:
- .1 Top hinge: 250 mm from head of door to top.
- .2 Bottom hinge: 265 mm from finished floor to bottom of hinge.
- .3 Intermediate hinge: Equal distance between top and bottom hinge.
- .4 Locksets, latchsets: 1000 mm.
- .5 Panic device crossbar: 1000 mm.
- .6 Push plates: 1100 mm to bottom of plates.
- .7 Guard bars: 1100 mm.
- .8 Door pulls: 1100 mm to bottom of pulls.

.9 Blank strike: 1450 mm.
.10 Blank fronts: 1450 mm.

.5 Include for supply and installation of wiring for electric strikes from electrical junction box to electric strike hardware.

.6 Locate door stops to contact doors 75 mm from latch edge.

.7 Install hardware and trim square and plumb to doors.

.8 Replace wrappings for hardware provided by manufacturer after installation.

.9 Safeguard keys to keep them out of unauthorized hands, tag them with door number, and deliver them to person designated by Consultant at building completion.

3.3 FIELD QUALITY CONTROL

.1 Have hardware inspected after installation by hardware supplier's representative, obtain certification in writing that hardware has been supplied and installed in accordance with Specifications and hardware manufacturer's instructions and is functioning correctly.

.2 Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements and Authorities having Jurisdiction.

.3 Test access control system and electrified hardware devices for proper operation. Verify electric door release hardware operates properly upon activation of fire alarm system.

3.4 ADJUSTING

.1 Verify under work of this Section, that installed hardware functions properly.

.2 Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by manufacturer's instructions.

.3 Adjust doors with self closing devices or automatic closing devices for proper operation after the HVAC system is balanced and adjusted. Verify spring power of non sized door closers is properly adjusted.

3.5 CLEANING

.1 Remove wrappings at completion of the Project and clean hardware in accordance with manufacturer's instructions.

3.6 HARDWARE GROUPS/SCHEDULE

.1 Hardware groups/schedule will be provided after Award of Contract.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment, tools, and services necessary for glass and glazing work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM C920, Specification for Elastomeric Joint Sealants.

.2 ASTM C1036, Standard Specification for Flat Glass.

.3 ASTM C1048, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

.4 ASTM C1376, Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

.5 ASTM D2240, Test Method for Rubber Property - Durometer Hardness.

.6 ASTM E1300, Standard Practice for Determining Load Resistance of Glass in Buildings.

.7 ASTM E2190, Standard Specification for Insulating Glass Unit Performance and Evaluation.

.8 BS EN 14179-1, Glass in building. Heat-soaked thermally-toughened soda lime silicate safety glass. Definition and description.

.9 BS EN 14179-2, Glass in building. Heat-soaked thermally-toughened soda lime silicate safety glass. Evaluation of conformity/product standard.

.10 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.

.11 CAN/CGSB-12.3-M, Flat, Clear Float Glass.

.19 CAN/CGSB-12.8, Insulating Glass Units.

.20 CAN/CGSB-12.10, Glass, Light and Heat Reflecting.

.12 Glass Association of North America (GANA) Glazing Manual.

.13 Insulating Glass Manufacturer Alliance (IGMA), Glazing Recommendations for Sealed Insulating Glass Units.

.14 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

.15 ULC CAN4 S104-M, Standard Method for Fire Tests of Door Assemblies.

.16 ULC CAN4 S106-M, Standard Method for Fire Tests of Window and Glass Block Assemblies.

1.3 **DESIGN REQUIREMENTS**

.1 Glass Design:
- .1 IGU units to meet energy requirements as indicated in Section 08 44 00. Coordinate with noted Sections as required for design, sizing and installation.
- .2 Design glass using a probability of breakage of 8 lites per 1000 at the first application of design load and to meet requirements of ASTM E1300.
- .3 Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- .4 Perform a thermal stress analysis on each glass unit with Low-E coating and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.
- .5 Perform a thermal stress analysis on each insulating thermal unit and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.
- .6 Where required by the thermal stress analysis, tempered glass used in exterior insulating glass units is to be heat soaked (TGLHS).
- .7 Where required, design glazing units so as not to allow thermal stress fracture due to heat build-up behind insulating units.

.2 Interior and exterior systems serving as a guard:
- .1 Design relevant interior and exterior glazed systems to act as a guard and withstand required guard and handrail loads in accordance with OBC requirements, SB 13 and applicable local regulations.
- .2 Design relevant interior glazed system and connections to act as a guard where the bottom of the framed system extends to a point below 1070 mm above finished floor level and separates a floor level from an adjacent interconnected space.
- .3 Design all exterior glazed screens and exterior windows labelled as a guard or located at the second floor with sills lower than 1070 mm above finished floor level and with a vertical drop on one side of the screen of more than 600 mm below shall be designed as guards per OBC requirements.
- .4 Provide a letter signed and sealed by a Professional Engineer certifying that the system work conforms to the OBC requirements.

.3 Structural Glazing:
- .1 Carry out design of structural silicone joints and transitions by rational analysis including all movements specified herein. Maximum stress shall not exceed 138 kPa (20 psi) in tension or shear for short term loading. Maximum stress in shear for long term loading due to the dead load of glass shall not exceed 7 kPa (1 psi) or the limit imposed by sealant manufacturer, whichever is less.
- .2 Joints to be essentially rectangular in shape and shall include no internal corners which could precipitate tearing or create high local stresses.
- .3 Single Source Responsibility for Sealants, Gaskets and Other Glazing Accessories: In order to ensure consistent quality of performance, provide all glazing sealants and seals from a single manufacturer.

.4 Preconstruction Compatibility and Adhesion Testing: Submit to sealant manufacturer, samples of each glass, gasket, glazing accessory and glass-framing member that will contact or affect glazing sealants for compatibility and adhesion testing. Schedule submission of test samples to provide sufficient time for testing and analysis of results to prevent delay in the progress of work.

.4 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.

.5 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.6 Design glazing in accordance with City of Toronto Green Development Standard - Bird Friendly Development Guidelines.

.7 Roller wave, bow and warp:
- .1 Heat treated flat glass to be by horizontal (roller hearth) process with inherent roller wave distortion parallel to the bottom edge of the glass as installed.
- .2 Maximum peak to valley roller wave 0.08 mm in the central area and 0.20 mm within 267 mm of the leading and trailing edge.
- .3 For clear glass 6 mm to 9.5 mm thick without ceramic frit or ink, maximum + or - 100 mD (millidiopter) over 95% of the glass surface.
- .4 Maximum bow and warp 0.79 mm per 300 mm.

1.4 SUBMITTALS

.1 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating as a minimum:
  - .1 Fabrication and erection of glazing elements indicating materials, thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
  - .2 To sealant manufacturer for their review and approval of tensile bead contact/bite dimension and thickness.

.2 Samples:
- .1 Submit following samples in accordance with Section 01 33 00.
- .2 Submit one sample of each type of glass.
  - .1 300 x 300 mm of each type of insulating glass unit, complete with each different Low-E coating.
  - .2 300 x 300 mm of spandrel glass.
  - .3 300 x 300 mm of ceramic frit glass.
  - .4 300 x 300 mm of fire rated glass.
  - .5 300 x 300 mm of each type of laminated glass.
  - .6 300 x 300 mm of shatterproof mirror.
  - .7 300 x 300 mm of glass film.

.3 Certificates and reports:
- .1 Submit manufacturer's certification that glass and glazing materials are compatible.
- .2 Submit glass thermal stress analyses. Include thermal stresses created by shadowing of exterior components or assembly and elevated interstitial space temperatures.
- .3 Submit thermal performance/properties analyses expected of all framing systems and insulating glass units included in the Project.
- .4 Submit compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.
- .5 Compatibility test report from manufacturer of insulating glass edge sealant, indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, setting blocks, edge blocks and any other material that contacts or can affect the edge seal.

.4 Manufacturer's methodology and records:
- .1 Submit heat treated glass manufacturer's quality control methodology to alleviate scratching and other detrimental effects on glass panes during the fabrication process.
- .2 Submit glass manufacturer's records for measuring roller wave as part of their quality control process.

.5 IGMA Compliance Audit: Submit in accordance with Section 01 33 00, a written certification of successful completion of a Compliance Audit within the last six months.

1.5 QUALITY ASSURANCE

.1 Insulating glass unit fabricators shall be a certified member of the Insulating Glass Manufacturer's Alliance (IGMA). IGMA members must participate in the certification program and shall have successfully passed a Compliance Audit within the last six months.

.2 The Consultant, third party inspection and testing agency, Commissioning Agent and/or Owner may visit the insulating glass unit manufacturer's facilities during manufacture/fabrication of products to be installed on this Project. If requested, the Contractor shall arrange for access for the Consultant to that manufacturer's facility to examine manufacture of the products for this Project.

.3 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of glazing units of a similar size and nature.

.4 Fire Protective Rated Glass: Each lite shall bear permanent, nonremovable label of ULC certifying it for use in tested and rated fire protective assemblies.

1.6 **SITE CONDITIONS**

.1 Glaze with compounds, sealants, or tapes only when glazing surfaces are at temperatures over 4 °C, and when positive that no moisture is accumulating on them from rain, mist, or condensation.

.2 When temperature of glazing surfaces is below 4 °C, obtain from Consultant and material manufacturer approval of glazing methods and protective measures which will be used during glazing operations.

1.7 **EXTENDED WARRANTY**

.1 In accordance with Sections 08 44 00 and 08 56 88.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 Glass manufacturers:
- .1 AGC Flat Glass.
- .2 Cardinal Glass Industries.
- .3 Guardian Industries.
- .4 Prelco Inc.
- .5 Viracon Inc.
- .6 Vitro Architectural Glass (formerly PPG Industries Ltd.)

2.2 **MATERIALS**

.1 General:
- .1 All materials under work of this Section, including but not limited to, primers, coatings, sealers, sealants, adhesives and cleaners are to have low VOC content limits.
- .2 All glass products of one type shall be produced by one company.
- .3 All coatings of a similar type shall be applied in a single production run to ensure colour match. Colour measurements of low-E coated glass to yield a delta E of less than 1 when measured in accordance with ASTM C1376.
- .4 Edges of glass shall be free from spalls, flake chips or rough chips which would be either visible or compromise the adhesion of the exterior weather seal or reduce the strength of glass when subjected to temperature differentials.

.2 Float glass **(FGL)**: CAN/CGSB-12.3-M; clear, glazing quality, minimum 6 mm thick. Clear or tinted as indicated. Heat strengthened as required.

.3 Heat strengthened glass **(HSGL)**: CAN/CGSB-12.3-M; clear float glass, glazing quality, heat strengthened in accordance with ASTM C 1048, Kind HS, minimum 6 mm thick unless indicated otherwise.

.4 Tempered glass **(TGL)**: CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear, minimum 6 mm thick.

.5 Tempered glass (heat soaked) **(TGLHS)**:
- .1 CAN/CGSB-12.1-M, Type 2, Class B, Category II and BS EN 14179-1, clear, minimum 6 mm thick.
- .2 As a minimum, following the tempering process, heat-soak glass to a temperature of 290°C±10°C for a minimum of 2 hours of the heat-soak period and cool slowly in accordance with BS EN 14179-2.

.6 Laminated glass **(LGL)**:
- .1 All PVB interlayers shall be as manufactured by Vanceva or approved alternative.
- .2 Colours: Coloured interlayers shall be selected by the Consultant from manufacturer's full colour range.
- .3 Laminated float glass - coloured interlayer and frit coating **(LGL1)**: to CAN/CGSB-12.1, Category II, consisting of 3 mm thick clear float glass with ceramic frit coating as specified herein on surface 1 (CFGL), 0.8 mm thick coloured PVB interlayer in blue colour as selected by the Consultant, minimum 3 mm thick clear float glass (FGL). For use in IGU of exterior curtain wall and window applications as indicated. Approximately 6.8 mm thick.
- .4 Laminated tempered glass - coloured interlayer and frit coating **(LGL1a)**: to CAN/CGSB-12.1, Category II, consisting of 3 mm thick clear tempered glass with ceramic frit coating as specified herein on surface 1 (CFGL), 0.8 mm thick coloured PVB interlayer in blue colour as selected by the Consultant, minimum 3 mm thick clear tempered glass (TGL). For use in IGU of exterior door applications. Approximately 6.8 mm thick.
- .5 Laminated float glass - clear interlayer and frit coating **(LGL2)**: to CAN/CGSB-12.1, Category II, consisting of 3 mm thick clear float glass with ceramic frit coating as specified herein on surface 1 (CFGL), 0.8 mm thick clear PVB interlayer, minimum 3 mm thick clear float glass (FGL). For use in IGU of exterior window applications as indicated. Approximately 6.8 mm thick.
- .6 Laminated tempered glass - clear interlayer **(LGL3 and LGL3a)**:
  - .1 Laminated glass (LGL3): to CAN/CGSB-12.1, Category II, consisting of 6 mm thick panes of clear tempered glass (TGL), sandwiching a 0.8 mm thick clear PVB interlayer. For use at glass partitions. Approximately 12.8 mm thick.
  - .2 Laminated glass (LGL3a): to CAN/CGSB-12.1, Category II, consisting of 3 mm thick panes of clear tempered glass (TGL), sandwiching a 0.8 mm thick clear PVB interlayer. For use at interior doors as indicated. Approximately 6.8 mm thick.
- .7 Laminated tempered glass - clear interlayer and ceramic frit coating **(LGL4)**: to CAN/CGSB-12.1, Category II, consisting of 3 mm thick pane of clear tempered glass with ceramic frit coating as specified herein (CFGL), a 0.8 mm thick clear PVB interlayer, 3 mm thick clear tempered glass (TGL). For use in IGU of exterior door applications as indicated. Approximately 6.8 mm thick.

.8 Laminated heat strengthened glass - clear interlayer and frit coating **(LGL5)**: to CAN/CGSB-12.1, Category II, consisting of 6 mm thick clear heat strengthened glass with ceramic frit coating as specified herein (CFGL), a 1.5 mm thick clear PVB interlayer, 6 mm thick clear heat strengthened glass (HSGL). For use at exterior glass guard, partitions and screens. Approximately 13.5 mm thick.

.9 Laminated tempered glass - coloured interlayer **(LGL6)**: to CAN/CGSB-12.1, Category II, consisting of 3 mm thick panes of clear tempered glass (TGL), sandwiching a 0.8 mm thick blue coloured PVB interlayer, to match exterior vestibule doors. For use at interior vestibule doors. Approximately 6.8 mm thick.

.10 Laminated tempered glass - coloured interlayer and emulsion coating **(LGL7)**: to CAN/CGSB-12.1, Category II, consisting of 6 mm thick pane of clear tempered glass (TGL), a 0.8 mm thick coloured PVB interlayer, 6 mm thick pane of clear tempered glass with a water-based emulsion coating on surface 4 (SGL), in colour as selected by the Consultant. For use at interior vestibule screen at lobby. Approximately 12.8 mm thick.

.7 Fire rated glass **(FRGL)**: 20 min. to 90 min. fire rating tested to ULC CAN4 S104-M and ULC CAN4 S106-M, 5 mm thick or as otherwise noted on Contract Drawings with appropriate labelling stating fire rating and approval, clear polished glass. Firelite by Nippon Electric Glass Company Ltd. or approved alternative.

.8 Spandrel glass **(SGL)**: ASTM C1048, Condition B, 6 mm thick heat strengthened (HSGL) and tempered glass (TGL) as specified and scheduled, with water-based silicone emulsion coating applied to backside, 'Opaci-Coat 300' by ICD High Performance Coatings or approved alternative. Colour: To the later selection of the Consultant.

.9 Ceramic frit glass **(CFGL)**:

.1 Unless otherwise indicated, 6 mm thick, clear float (FGL), laminated (LGL), heat strengthened glass (HSGL) or tempered glass (TGL) as scheduled with ceramic frit coating applied to surface 1, screen transferred to glass surface and heat cured. Ceramic frit glass by Prelco or approved alternative by Viracon or approved alternative manufacturer.

.2 Ceramic frit pattern and colour: 5 mm diameter ceramic frit dots spaced at 50 mm on centre. Colour as selected by the Consultant.

.10 Shatterproof acrylic mirror **(MR3)**:

.1 Minimum 6 mm thick, shatterproof colourless acrylic mirrored sheet with mirror coated backing. 'Acrylite Reflections' by Acrylite or approved alternative. Sizes as indicated on Contract Drawings.

.2 Acrylic mirrored sheet to be free of imperfections, air bubbles, inclusions and surface defects, suitable for vacuum forming, virgin acrylic monomer.

.3 Mirror attachment accessories:

.1 Mirror adhesive: Chemically compatible with mirror coating and wall substrate.

.2 Mirror frames: Stainless steel.

.3 Stainless steel clips.

.4 Shatterproof mirrors shall be used in all children's areas as a standard as a safety measure.

.11 Glass film **(GF)**: Pressure-sensitive translucent glass film with dusted crystal pattern in white colour. 'Scotchcal Dusted Crystal Film' and manufactured by 3M or approved alternative. Application pattern as indicated on drawings.

.12 Insulating glass units (triple seal):
- .1 To CAN/CGSB-12.8-M, ASTM E2190 and IGMA requirements utilizing approved stainless steel edge spacer. Triple seal with a PIB primary seal and silicone secondary seal.
- .2 To comply with IGMA labelling requirements to be considered certified. Materials, excluding the glass, shall be from the same manufacturer as those employed for the certification of the insulating glass units.
- .3 Spacer bar placement and sightline tolerance shall be +/- 3 mm and in accordance with GANA requirements.
- .4 No skips, gaps or voids shall occur in primary or secondary seals.

.13 Argon gas: 100% pure. Argon gas to be used to fill air space at all insulated glass units.

.14 Low-E coating:
- .1 ASTM C1376, high performance sputtered low-E coating. Provide insulating glass units with low-E coating edge deletion and low-E coating. Apply low-E coating to third and fifth surfaces as scheduled, unless otherwise indicated.
- .2 Edge of low E shall be located within the primary seal.
- .3 Low E coatings, 'EnergySelect 36' by AGC Flat Glass, 'Cardinal LoE-272' by Cardinal Glass Industries or 'SN 68' by Guardian Industries.

.15 Glazing and rebate primers, sealants, sealers, and cleaners: Compatible with each other. Type as recommended by sealant, spline, and glass manufacturer.

.16 Glazing sealant: Silicone sealant as recommended by glazing manufacturer. Verify compatibility with insulating glass unit secondary sealant.

.17 Glazing Sealant (Structural Glazing - SSG):
- .1 Silicone, One Part in accordance with ASTM C920, Type S or M, Grade NS, Class 25.
- .2 Structural glazing tensile bead: 'Proglaze SSG' by Tremco or 'Dowsil 795' by Dow Consumer Solutions.
- .3 Structural glazing weather bead: 'Spectrem 2 Sealant' by Tremco or 'Dowsil 795' by Dow Consumer Solutions.
- .4 Structural glazing (factory glazed): Two-part, neutral cure silicone sealant, 'Proglaze II' by Tremco or 'Dowsil 983' by Dow Consumer Solutions.
- .5 Colour to later selection of Consultant.

.18 Heel & toe bead: Silicone sealant as recommended by glazing manufacturer.

.19 Glazing gasket: 'Visionstrip' or Polyshim II' by Tremco Ltd., glazing seal, size as recommended by manufacturer.

.20 Glazing tape: 'Polyshim II' glazing tape EPDM shim.

.21 Glazing tape (fire rated glass): Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.

.22 Glazing splines: Silicone, extruded shape to suit glazing channel retaining slot, colour as selected.

.23 Setting blocks (regular): EPDM, 80 - 90 Shore A durometer hardness to ASTM D2240, sized to suit glazing method, glass unit weight and area.

.24 Setting blocks (balustrades): Neoprene, 80 - 90 Shore A durometer hardness to ASTM D2240, 100 mm long x 6 mm high x 9 mm wide minimum, size designed for glass size and weight of glass unit.

.25 Spacer shims (balustrades): Neoprene, 50 - 60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.26 Setting Block (for Structural Glazing): Silicone setting blocks with Shore, Type A durometer hardness of 85, plus or minus 5 to ASTM D2240, sized to suit glazing method, glass unit weight and area.

.27 Edge blocks: EPDM, 60-70 Shore A Durometer hardness, self adhesive on face, sized with 3 mm clearance from glass edge and spanning glass thickness(es).

.28 Glass presence markers: Easily removable, non-residue depositing.

.29 Screws, bolts and fasteners: Type 304 stainless steel.

2.3 **GLAZING AND FILM SCHEDULE**

.1 General: Glass types shall be as indicated below unless otherwise required due to thermal stress analysis.

.2 **Glazing Type GL-1** (clear glass with frit pattern - for use at curtain walls and windows):
- Minimum 6 mm thick clear float ceramic frit glass (CFGL, frit on surface 1) outside, argon filled air space, minimum 6 mm thick clear float glass (FGL) middle, argon filled air space, minimum 6 mm thick clear float glass (FGL) inside, complete with low E coating on surface 3 and glass film (GF) in application pattern as shown on inside pane (surface 6).
- 44 mm overall thickness.

.3 **Glazing Type GL-2** (coloured glass with frit pattern - for use at curtain walls and windows):
- Minimum 6.8 mm thick laminated float glass with coloured PVB interlayer and ceramic frit coating on surface 1 (LGL1) outside, argon filled air space, minimum 6 mm thick clear float glass (FGL) middle, argon filled air space, minimum 6 mm thick clear float glass (FGL) inside, complete with low E coating on surface 3 and glass film (GF) in application pattern as shown on inside pane (surface 6).
- 44.8 mm overall thickness.

.4 **Glazing Type GL-3** (clear glass with frit pattern - for use at curtain walls and windows)**:**
- Minimum 6.8 mm thick laminated float glass with clear PVB interlayer and ceramic frit coating on surface 1 (LGL2) outside, argon filled air space, minimum 6 mm thick clear tempered glass (TGL) middle, argon filled air space, minimum 6 mm thick clear tempered glass (TGL) inside, complete with low E coating on surface 3 and glass film (GF) in application pattern as shown on inside pane (surface 6).
- 44.8 mm overall thickness.

.5 **Glazing Type GL-4:**
- Minimum 12.8 mm thick clear tempered/laminated glass (LGL3), for use at standard framed glazed partitions, frameless U channel glass partitions and interior windows, interior glazed partitions at vestibule, complete with glass film (GF) in locations and application patterns as shown.
- Frameless glass interior partitions shall have structural silicone vertical butt joints.

.6 **Glazing Type GL-5** (spandrel glass):
- Minimum 6 mm thick clear heat strengthened glass ceramic frit glass (CFGL, frit on surface 1) outside, argon filled air space, 6 mm thick heat strengthened spandrel glass (SGL, emulsion coating on surface 4) middle, argon filled air space, minimum 6 mm thick clear heat strengthened glass (HSGL) inside, complete with low E coating on surface 3.
- 44 mm overall thickness.

.7 **Glazing Type GL-6** (coloured glass with frit pattern - for use at exterior doors):
- Minimum 6.8 mm thick laminated tempered glass with coloured PVB interlayer and ceramic frit coating on surface 1 (LGL1a) outside, argon filled air space, minimum 6 mm thick clear tempered glass (TGL) middle, argon filled air space, minimum 6 mm thick clear tempered glass (TGL) inside, complete with low E coating on surface 3 and glass film (GF) in application pattern as shown on inside pane (surface 6).
- 44.8 mm overall thickness.

.8 **Glazing Type GL-7** (clear glass with ceramic frit coating - for use at exterior doors):
- Minimum 6.8 mm thick clear tempered/laminated glass with clear PVB interlayer and ceramic frit coating on surface 1 (LGL4) outside, argon filled air space, minimum 6 mm thick clear tempered glass (TGL) middle, argon filled air space, minimum 6 mm thick clear tempered glass (TGL) inside, complete with low E coating on surface 3 and glass film (GF) in application pattern as shown on inside pane (surface 6).
- 44.8 mm overall thickness.

.9 **Glazing Type GL-8**: Minimum 6 mm thick clear tempered glass (TGL), for use at vision panels of non-rated interior doors, glazed screens and interior sliding windows and glass film (GF) in application pattern as shown.

.10 **Glazing Type GL-9**: Minimum 5 mm thick, clear, fire rated glass (FRGL) used at interior glass lites in fire-rated doors, and glass film (GF) in application pattern as shown.

.11 **Glass Type GL-10:** Minimum 13.5 mm thick clear heat strengthened/laminated glass with ceramic frit coating applied to surface 1 (LGL5), for use at exterior glass guard, partitions and screens.

.12 **Glazing Type GL-11**: Minimum 6 mm thick shatterproof acrylic mirrors (MR3), for use at washrooms where custom sized mirrors are required.

.13 **Glazing Type GL-12**: Minimum 6.8 mm thick laminated tempered glass with coloured PVB interlayer (LGL6), for use interior aluminum doors at vestibules and to match glazing of exterior vestibule doors.

.14 **Glazing Type GL-12a**: Minimum 6.8 mm thick laminated tempered glass with clear PVB interlayer (LGL3a), for use interior aluminum doors at vestibules.

.15 **Glazing Type GL-13**: Minimum 12.8 mm thick laminated tempered glass with coloured PVB interlayer and emulsion coating on surface 4 (LGL7), for use interior aluminum vestibule screen.

2.4 **FABRICATION**

.1 Prior to delivery, have manufacturer confirm in writing that frit spacing was reviewed and found to be uniform in size and spacing.

.2 Verify glazing dimensions on Site.

.3 Clearly label each glass lite with maker's name and glass type. Ensure labels are easily removable, non-residue depositing type. Do not remove labels until after Work is accepted by Consultant.

.4 Fabricate glazing not less than 3 mm smaller than rebate size in either dimension; allow for edge spacers, shims, and setting blocks as necessary.

.5 Work shall have smooth finished surfaces free from distortion and defects detrimental to appearance and performance.

.6 Carefully make and fit details. Take special care with exposed finished work to produce a neat and correct appearance to the Consultant's acceptance.

.7 Grind and polish a 1.5 mm arris to both edges of exposed glazing at locations where glazing is not encapsulated in framing and where edges are exposed to occupants.

.8 Fabricate argon filled thermal units with air space filled minimum 90% with argon gas.

.9 Provide bird friendly ceramic frit coatings for required glazing to meet requirements of the City of Toronto Green Development Standard - Bird Friendly Development Guidelines. Style as selected by Consultant.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Verify that openings for glazing are correctly sized and within tolerance.

.3 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

.4 Laminated glass edges shall be completely covered by tape to protect against sealants and water if required by manufacturer.

3.2 **PREPARATION**

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 **INSTALLATION**

.1 Provide glazing in accordance with IGMA recommendations. Provide continuous contact between glazing tapes and gasket to the glazing.

.2 Install glazing to the work of Sections 05 50 00, 06 20 00, 08 11 13, 08 14 16, 08 44 00 and 08 56 88.

.3 Provide neat, straight sight lines. Trim excess glazing tape flush with top of stops and fixed leg of frames.

.4 Remove protective coatings, glazing stops, clean rebate and glass contact surfaces with solvent, wipe dry.

.5 Apply primer/sealer to contact surfaces, prior to glazing.

.6 Apply glazing tape as per manufacturer’s instructions including recommended corner sealant.

.7 Use setting blocks no closer than 150 mm from corners of insulating glass units, unless windows are too narrow and at 1/4 points and spacers to centre glass unit in frame.

.8 Install glazing in accordance with reviewed shop drawings and manufacturer's written instructions. Install glazing with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.

.9 Apply a continuous heel bead of sealant around perimeter of inboard lite of the sealed unit and the metal framing.

.10 Re-install glazing stops ensuring continuous contact and rattle-free installation. Do not distort glass. Trim tape protruding more than 2 mm above stop.

.11 Install glazing gasket in accordance with manufacturer’s recommendations.

.12 Do not cut or abrade tempered, heat treated, or coated glass.

.13 Install glass presence markers in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

.14 Remove, dispose of, and replace broken, cut, abraded glass, and defective glass including but not limited to production dimples, roller wave or marks, tong marks, chips, cracks, etc.

.15 Exterior glass: Glaze units with gasket on exterior side and glazing tape on interior side. Seal gap between glazing and stop with sealant to depth equal to bite of frame. Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

.16 Structural glazing:
- .1 Glaze units in accordance with reviewed shop drawings and in accordance with manufacturer’s written instructions.
- .2 Seal all enclosure transitions (exterior envelope, vestibule enclosures, etc.) in accordance with reviewed shop drawings.

.17 Interior glass: Glaze interior glass using glazing gasket glazing tape.

.18 Fire rated glass:
- .1 Install fire rated safety glass and associated components in accordance with reviewed shop drawings, manufacturer’s written instructions and to meet requirements of authorities having jurisdiction.
- .2 Place setting blocks located at quarter points of glass with edge block no more than 150 mm from corners.
- .3 Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.
- .4 Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.
- .5 Place glazing tape on free perimeter of glazing in same manner described above.

.6 Install removable stop and secure without displacement of tape.
.7 Install so that appropriate ULC markings remain permanently visible.

.19 Glass guard:
.1 Install laminated glass in accordance with reviewed shop drawings and manufacturer's written instructions.
.2 Coordinate with Section 05 50 00 as required for installation of glazing material with steel framing.
.3 Install glass guard to extent, locations, sizes and details shown.
.4 Maximum vertical space between ends of glass lights or between ends of glass lights and building walls shall be 20 mm except where shown otherwise.
.5 Mount glass rigidly in steel framing to proper spacing, levelness and alignment.

.20 Glazed wood screens:
.1 Install glass and glazing materials as required for glazed wood screens under work of Section 06 20 00 in accordance with reviewed shop drawings and manufacturer's written instructions.
.2 Apply glazing tape to glass and mount glass rigidly in wood frame.
.3 Ensure proper spacing, level, alignment and plumbness of wood screens using glass stops and shims as recommended by manufacturer.

.21 Glass film
.1 Install glass film with adhesive, applied in accordance with film manufacturer's instructions and in patterns as shown on Contract Drawings.
.2 Place without air bubbles, creases or visible distortion.
.3 Fit tight to glass perimeter with razor cut edge.

.22 Custom shatterproof acrylic mirrors:
.1 Install mirrors in accordance with manufacturer's written instructions.
.2 Install mirrors in one single piece in sizes indicated without joints.
.3 Set mirrors with adhesive and clips, applied in accordance with manufacturer's instructions.
.4 Where indicated, provide continuous metal trim along all mirror edges, with mitred corners and concealed fastenings.

.23 Install bird warning glass in accordance with City of Toronto Green Development Standard - Bird-Friendly Development Guidelines.

3.4 **CLEANING**

.1 Immediately remove sealant and compound droppings from finished surfaces.

.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

.3 Clean glass surfaces with cleaning agents and methods in accordance with Manufacturer's written instructions.

.4 Do not wash glass film for 30 days after installation.

.5 Do not use bristle brushes on glass film.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for louvres work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels - Series: Components, Coatings and Finishes.

.2 ASTM B209M Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.3 ASTM B211M Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.

.4 ASTM C920, Specification for Elastomeric Joint Sealants.

.5 CAN/CGSB-1.108-M, Bituminous Solvent Type Paint.

1.3 **DESIGN REQUIREMENTS**

.1 Design louvre work in accordance with OBC and to withstand live, dead, lateral. wind, seismic, handling, transportation and erection loads.

.2 Aerodynamic performance: Free area as specified herein.

.3 Limit deflection of louver members to not more than 1/180 of span between supports when subjected to wind load of 1 Kpa applied horizontally to louvre face.

.4 Design louvers to accommodate expansion and contraction of components due to temperature changes.

1.4 **SUBMITTALS**

.1 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating fabrication and erection details, including anchorage, accessories, thicknesses, profiles, finishes, pressure drop, face area, and free area.

.2 Samples: Submit duplicate 600 x 600 mm samples of louvres in accordance with Section 01 33 00 indicating frame and reinforcing, bird screens finished in selected colours.

.3 Certification: Submit certified data from independent laboratory substantiating aerodynamic performance.

.4 Close-out submittals: Submit operation and maintenance data for incorporation into Operations and Maintenance Manual in accordance with Section 01 78 23.

1.5 **QUALITY ASSURANCE**

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of louvres of a similar size and nature and that is approved by manufacturer. Submit to Consultant, installer's current certificate of approval by the material manufacturer as proof of compliance.

2 Products

2.1 **MANUFACTURED UNITS**

.1 Fixed aluminum louvre (LV):
- .1 Acceptable products and manufacturers: 'Model A6177' by Construction Specialties Inc. or approved alternative by MW McGill Ltd., Ten Plus Architectural Products Ltd. or approved alternative manufacturer.
- .2 Aluminum sheet: ASTM B209M.
- .3 Depth: 150 mm.
- .4 Frame and mullion: ASTM B211M; Extruded aluminum alloy Aluminum Association alloy 6063-T5 assembled with fastenings. 3 mm thickness minimum for head, sill, and jamb. Mullions: Concealed at 1500 mm maximum centres.
- .5 Blade: Stormproof with centre watershed in blade, 2.0 mm thick minimum; maximum blade length: 1500 mm.
- .6 Finish and colour: Conforming to AAMA 2605, fluoropolymer coating system, to match ArcelorMittal Dofasco colour 'Cambridge White QC 8695'.
- .7 Options:
  - .1 Duct collars.
  - .2 Extended sill, finished to match louvre.
- .8 Louvre types, sizes and free area as follows:
  - .1 Louvre (LV-1): 900 x 900 mm (36" x 36") exhaust louver (3500 cfm airflow) shall have a minimum of 0.46 m^2 (4.97 ft^2) of free area.
  - .2 Louvre (LV-2): 900 x 1000 mm (40" x 36") intake louver (4000 cfm airflow) shall have a minimum of 0.52 m^2 (5.57 ft^2) of free area.
  - .3 Louvre (LV-3): 400 x 300 mm (16" x 12") exhaust louver for Servery 209 range hood (290 cfm airflow) to have minimum 0.04 m^2 (0.42 ft^2) free area.

2.2 **ACCESSORIES**

.1 All materials under work of this Section, including but not limited to, sealants are to have low VOC content limits.

.2 Isolation coating: CAN/CGSB-1.108-M; Bituminous solvent type paint.

.3 Bird screen: Crimped 1.6 mm diameter aluminum wire mesh secured to 2 mm minimum thick extruded aluminum U frame mitred at corners. Mesh size: 12.7 mm.

.4 Anchors and fasteners: AISI Type 304 stainless steel.

.5 Insulating sealant tape: Self-adhering, open-cell polyurethane foam impregnated with a water-based acrylic impregnation, insulating perimeter tape, ‘MST’ by Emseal or approved alternative by Tremco.

.6 Sealant: ASTM C920, Type S, Grade NS; One-part, ultra-low modulus, moisture curing silicone sealant, ‘Dowsil 790' by Dow Consumer Solutions or Spectrem 1 by Tremco Ltd. Colour: As selected by Consultant. Primer and joint backing as recommended by sealant manufacturer.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Coordinate framing and anchorage for louvres with other parts of the Work.

.2 Install bird screen to inside face of louvres.

.3 Install louvres in accordance with manufacturer's instructions and accepted shop drawings. Securely anchor into opening.

.4 Apply isolation coating to separate dissimilar metals, and metals and masonry or concrete unless neoprene washers are shown.

.5 Install duct collars as required and extended sills as indicated.

.6 Provide specified insulating sealant tape along the interior edge of louvre framing at junctures with adjacent construction to prevent air infiltration and in accordance with manufacturer’s written instructions

.7 Seal louvre perimeter with sealant and joint backing for weather tight seal in accordance with requirements of Section 07 92 00.

3.3 **CLEANING**

.1 Maintain louvre work in clean condition throughout construction period. Remove all corrosive or foreign materials or droppings resulting from work of this Section or other trades.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for gypsum board work.

1.2 **REFERENCES**

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM C475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.3 ASTM C645, Specification for Nonstructural Steel Framing Members.

.4 ASTM C754, Specification for Steel Framing Members to Receive Screw-Attached Gypsum Board.

.5 ASTM C834, Standard Specification for Latex Sealants.

.6 ASTM C840, Specification for Application and Finishing of Gypsum Board.

.7 ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.

.8 ASTM C1002, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.9 ASTM C1177, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

.10 ASTM C1178, Specification for Glass Mat Water-Resistant Gypsum Backing Board.

.11 ASTM C1278, Specification for Fiber-Reinforced Gypsum Panel.

.12 ASTM C1396, Specification for Gypsum Board.

.13 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 **DESIGN REQUIREMENTS**

.1 Design ceiling suspension system in accordance with manufacturer's printed directions and ASTM C754.

.2 Design ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.4 Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures.

.5 Design subframing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent the regular spacing of hangers.

.6 Design wall framing system and reinforce as necessary to accommodate and support items attached to and supported by wall framing system.

.7 Design wall framing system for wall assemblies with a height greater than 3000 mm and those assemblies incorporating non-standard gypsum board assemblies including, but not limited to, abuse resistant gypsum board, cement board, large format tile applications, etc.

1.4 REGULATORY REQUIREMENTS

1. Provide fire separations and fire protection exactly as specified in test design specification that validates the specified rating. Verify that work specified in other Sections, as a part of the entire assembly, meets applicable validating test design specification.

1.5 SUBMITTALS

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop Drawings:
- .1 Submit Shop Drawings in accordance with Section 01 33 00 indicating:
  - .1 Wall assemblies, suspension systems, adjacent construction, elevations, sections and details, dimensions, thickness, finishes and relationship to adjacent construction.
  - .2 Framing and blocking for items being supported of wall systems.

.3 Samples: Submit samples in accordance with Section 01 33 00 of the following:
- .1 Two 300 mm long samples of mullion trim caps demonstrating profile, colour and finish.

.4 Certifications: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.6 QUALITY ASSURANCE

.1 Qualifications: Execute the work of this Section by skilled, qualified, and experienced workers trained in the installation of the work of this Section.

.2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in work of comparable complexity and scope, to perform following services as part of work of this Section:

- .1 Design of wall systems with height greater than 3000 mm and at non-standard gypsum board assemblies including, but not limited to, assemblies incorporating abuse resistant gypsum board, cement board, large format tile applications, etc.
- .2 Design of suspended gypsum board assemblies.
- .3 Design of ceiling support systems required to remain in place Post-Disaster.
- .4 Review, stamp, and sign Shop Drawings and design calculations.
- .5 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed Shop Drawings.

1.7 SITE CONDITIONS

.1 Do not begin work of this Section until:

- .1 Mechanical and electrical work above the ceiling is complete.
- .2 Substrate and ambient temperature is above 15°C.
- .3 Relative humidity is below 80 %.
- .4 Ventilation is adequate to remove excess moisture.

.2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and 24 h after installation.

1.8 EXTENDED WARRANTY

.1 Manufacturer's warranty: Manufacturer agrees to repair or replace sound barrier mullion trim caps that fail in materials or workmanship within specified warranty period.

- .1 Warranty Period: Ten years limited warranty from date of Substantial Performance.
- .2 Limited warranty does not cover adjacent products or improper installation.

2 Products

2.1 MATERIALS

.1 General:

- .1 All materials under work of this Section, including but not limited to, sealants, adhesives, and primers are to have low VOC content limits.
- .2 Wherever possible, gypsum board, steel studs, ceilings and framing used in work of this Section are to contain recycled content.
- .3 Gypsum board provided by this Section shall be construed to mean drywall and gypsum wall board where shown on Contract Drawings.

.4 Cement board provided by this Section shall be construed to mean cement board and cementitious board where shown on Contract Drawings.

.2 Steel framing: ASTM C754; ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.
.1 Bailey Metal Products Limited.
.2 Corus Metal Profiles.

.3 Steel studs and track runners: ASTM C645; Galvanized steel studs and runners, 32 mm wide x depth as indicated on Contract Drawings. Formed from galvanized steel sheet, thicknesses as follows:
.1 Studs less than 3000 mm: Minimum 0.53 mm (25 ga.).
.2 Studs greater than 3000 mm, non-standard assemblies and Level 3 studs: Minimum 0.91 mm (20 ga.), unless stud thickness of greater thickness is required to accommodate intended loading, spans, or conditions.
.3 End and corner metal studs: Minimum 1.9 mm (14 ga.).
.4 Openings, jambs, sills and headers: 1.9 mm Minimum (14 ga.).
.5 Track runners and ancillary components to match stud thickness.

.4 Main carrying channels: ASTM C645; Formed from galvanized steel sheet, 38 x 19 mm cold rolled, channels.

.5 Resilient channel: ASTM C645; 0.5 mm thick galvanized metal, 57 mm wide x 12 mm deep for walls and ceiling to reduce sound transmission.

.6 Furring channels: ASTM C645; Formed from galvanized steel sheet, 22 mm winged flange type, cold rolled.

.7 Furring channels (hat type): ASTM C645; 0.5 mm base steel thickness, galvanized. 70 mm wide x 22 mm deep hat shaped channel.

.8 Heavy duty furring channels: ASTM C645; 0.9 mm steel thickness, galvanized hat shaped channel with a wider and deeper size as required by manufacturers.

.9 Hanger wires: 4.1 mm minimum diameter galvanized pencil rod.

.10 Tie wire: 1.6 mm thick minimum diameter, soft annealed, galvanized steel wire.

.11 Corner bead, casing bead, and special shapes: Formed from 0.6 mm thick minimum, galvanized steel sheet, designed to be concealed by joint compound.

.12 Deflection track: ASTM C 645 top runner with 50.8-mm- deep flanges, in thickness indicated for studs and in width to accommodate depth of studs.

.13 Ceiling clips: Hot dip galvanized partition attachment clips, in square and reveal edge; ‘PAC 15 Series’ to match grid system by CGC Inc. or approved alternative.

.14 Gaskets (acoustic partitions): Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 3.2 mm thick, in width to suit steel stud size.

.15 Control joint strip: Roll formed from galvanized steel sheet, with a tape protected recess, 6 mm wide x 11 mm deep.

.16 Screw fasteners: ASTM C1002 Type S; Corrosion resistant.

.17 Concrete anchors: tie wire sleeve anchors, 'Redi-Drive Anchors' by ITW Red Head or approved alternative.

.18 Batt insulation: In accordance with Section 07 21 00.

.19 Sealants:
- .1 Acoustic sealant (non-rated): Non-hardening acoustic sealant for use at non-rated assemblies, ASTM C834 and ASTM C919; Acrylic, mould resistant sealant, paintable. 'Smoke and Acoustic Sealant CP506' by Hilti or approved alternative.
- .2 Sealant (fire-rated): Non-hardening sealant for use at fire-rated assemblies: ASTM E84; Acrylic based firestop sealant, colour: red or white as selected by Consultant. 'Flexible Firestop Sealant CP606' by Hilti or approved alternative.
- .3 Standard sealants: In accordance with Section 07 92 00.

.20 Vibration isolation ceiling hangers: unit shall consist of a steel spring in series with a neoprene isolating element. Model W30N manufactured by Mason Industries Inc., or approved alternative by PAC International or approved alternative manufacturer. Provide hangers to ensure that working load does not exceed 2/3 of solid load. Design hangers to tolerate 30 deg. misalignment.

.21 Gypsum board: ASTM C1396; gypsum board 12.7 mm and 15.9 mm thicknesses, of maximum practical lengths to minimize end joints, unless indicated otherwise. Furnish Board by Certainteed Gypsum Canada, CGC Inc., or Georgia-Pacific Canada LP.

.22 Fire rated gypsum board: ASTM C1396; gypsum board 15.9 mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise. Furnish Type X Board by Certainteed Gypsum Canada, CGC Inc., or Georgia-Pacific Canada LP.

.23 Abuse resistant panels:
- .1 ASTM C1396 and ASTM C1629; 12.7 mm and 15.9 mm thicknesses unless indicated otherwise on drawings; 'Abuse Resistant' by Certainteed Gypsum Canada, 'Sheetrock AR' by CGC Inc. or 'ToughRock' by Georgia-Pacific Canada LP.
- .2 Furnish Type X version of specified abuse resistant board where indicated or required by authorities having jurisdiction.

.24 Moisture and mould resistant board:
- .1 12.7 mm and 15.9 mm thicknesses as scheduled, of maximum practical lengths to minimize end joints, unless indicated otherwise; 'M2Tech Moisture and Mould Resistant' by Certainteed Gypsum Canada, 'Sheetrock Mold Tough' by CGC Inc. or 'DensArmor Plus High Performance Interior Panel' by Georgia-Pacific Canada LP.
- .2 Furnish Type X version of specified moisture and mould resistant board where indicated or required by authorities having jurisdiction.

.25 Moisture, mould, and abuse resistant panels:
- .1 12.7 mm and 15.9 mm thicknesses unless indicated otherwise on drawings; 'AirRenew Extreme Impact Resistant with M2Tech' by Certainteed Gypsum Canada, 'Sheetrock Mold Tough AR' by CGC Inc. or 'DensArmor Plus Abuse-Resistant Interior Panel' by Georgia-Pacific Canada LP.
- .2 Furnish Type X version of specified moisture, mould and abuse resistant board where indicated or required by authorities having jurisdiction.

.26 Tile backer board: Water resistant tile backer board meeting ASTM C1178 or ASTM C1278, thickness as indicated. 'Diamondback Tile Backer' by Certainteed Gypsum Canada, 'Fiberock Aqua-Tough Underlayment' by CGC Inc. or 'Dens Shield' by Georgia-Pacific Canada LP.

27. Cement/cementitious board:
- .1 ASTM C1177, high strength portland cement building panel with self adhesive glass tape; provide board with heavier mesh reinforcement for suspended applications. 'Durock Cement Board Next Gen.' by CGC Inc., or approved alternative by Certainteed Gypsum or approved alternative manufacturer.

.28 Shaftwall gypsum system:
1. Steel J-Runner: ASTM C645; Rolled formed sheet steel, 25 gauge, by CGC, Gypsum Corporation or approved alternative.
2. C-H stud: hot-dipped galvanized by CGC, Gypsum Corporation or approved alternative.
3. Liner Panel: ASTM C1396; Gypsum wallboard panel, Thickness: 25.4 mm, Width: 610 mm. 'M2Tech Shaftliner Type X' by Certainteed Gypsum Canada, or approved alternative by CGC or Gypsum Corporation.
4. Face Panel: ASTM C1396; Gypsum wallboard panel, 1 layer, Thickness: 15.9 mm, Width: 1219 mm. 'GlasRoc Shaftliner Type X' by Certainteed Gypsum Canada, or approved alternative by CGC or Gypsum Corporation.

.29 Special trim pieces: to include, but not limited to, the following:
1. Provide paintable aluminum trims exposed to view, unless otherwise indicated.
2. Shadow reveals:
   - .1 Wall reveals: Formed from extruded aluminum alloy 6063 T5, shadow mold wall reveal 'DRM-625-50' by manufactured by Fry Reglet or approved alternative.
   - .2 Ceiling reveals: Formed from extruded aluminum alloy 6063 T5, shadow mold ceiling reveal 'DRM-50-50' by manufactured by Fry Reglet or approved alternative.

3. Z reveal (at window sill and wainscot panels and at gypsum board abutting wood beams or wood deck): Formed from extruded aluminum alloy 6063 T5, for z reveal at window sills and wainscot panels and at gypsum board abutting wood beams or wood deck, 'DRMZ-625-50' by manufactured by Fry Reglet or approved alternative.
4. Ceiling trim (typical): Formed from extruded aluminum alloy 6063 T5, for wall at ceiling trim, 'DRMCT-625-50' by manufactured by Fry Reglet or approved alternative.
5. W ceiling trim (acoustical ceilings): Refer to Section 09 51 00 for ceiling trim.
6. W ceiling trim (gypsum board): Formed from extruded aluminum alloy 6063 T5, for wall at ceiling gypsum board molding, 'DRWT-50-50' by manufactured by Fry Reglet or approved alternative.
7. Gypsum board/acoustical ceiling juncture: Formed from extruded aluminum alloy 6063 T5, for molding at gypsum board and acoustical ceiling junctures, 'DRMAD-50-50' by manufactured by Fry Reglet or approved alternative.
8. J moldings: Formed from extruded aluminum alloy 6063 T5, 'JDM-50' and 'JDM-625' by manufactured by Fry Reglet or approved alternative.
9. Control joint: Formed from extruded aluminum alloy 6063 T5, 2 piece control joint, 'DRM-50-50' by manufactured by Fry Reglet or approved alternative.

.30 Mullion trim cap:
1. Provide all components and accessories as required for complete installation of mullion trim caps and as required to meet STC rating of 55. For use at gypsum board partition and exterior aluminum mullion as shown on Contract Drawings.
2. Extruded aluminum mullion cap trim with low profile return leg, sizes as indicated, 'Classic Sound Barrier Mullion Trim Cap' by Mull-It-Over Products or approved alternative to match curtain wall finish and colour.
3. Trim cap to be complete with sound absorbing foam, resistant to smoke, flame and microbial growth and compressible foam for use between the edge of the extrusion and interior face of the curtain wall glass and snap-on fastener cover.
4. Mullion trim cap to be sized to accommodate thermal movement.
5. Furnish units in lengths of sufficient additional length to allow for field trimming to required length to match variations in construction tolerances of adjacent systems.
6. Fasteners: Types as recommended by trim cap manufacturer, compatible with all materials.

31. Primer: Where indicated by board manufacturer, provide primer as required to achieve finishes as defined in ASTM C840.

32. Latex fortified mortar: Of type recommended by cementitious board manufacturer to suit application.

.33 Joint reinforcing tape:
1. Standard gypsum board: ASTM C475; 50 mm wide x 0.25 mm thick, perforated paper, with chamfered edges.
.2 Moisture resistant and tile backer boards: ASTM C475; fibreglass mat joint tape as recommended by board manufacturer to suit location.

3. Cement board: Mesh reinforcing tape recommended by cement board manufacturer.

.34 Bonding adhesive: Type for purpose intended and as recommended and approved by manufacturer.

.35 Joint and patching compound: ASTM C475; Asbestos-free, supplied by manufacturer of gypsum board used.

.36 Fast setting patching compound: ASTM C475; Asbestos-free, Sheetrock or Durabond by CGC Inc., 'Moisture and Mold Resistant Setting Compound with M2Tech' by Certainteed Gypsum Canada or approved alternative.

.37 Access doors: Supplied by other Sections for installation as part of the work of this Section.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 SUSPENSION FRAMING

.1 Install ceiling systems in accordance with reviewed Shop Drawings and manufacturer's written instructions.

.2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.

.3 Install vibration isolation hangers at all locations where indicated in strict accordance with manufacturer's printed instructions.

.4 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.

.5 Install additional hangers at lighting fixture and ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.

.6 Install main carrying channels transverse to structural framing members. Lap main carrying channels 200 mm minimum at splices and wire each end with two loops and prevent clustering or lining-up of splices.

.7 Install furring channels at 400 mm o.c., not less than 25 mm, and not more than 150 mm from perimeter walls, at openings, at interruptions in ceiling continuity, and at change in plane. Install furring channels to a tolerance of 3 mm maximum in 3600 mm.

.8 Install additional main carrying and furring channels to frame and to reinforce openings such as recessed lighting fixtures, access hatches, ceiling grilles, outlet boxes, ventilating outlets and similar items.

3.3 **STEEL STUDS AND FURRING**

.1 Install steel studs and furring in accordance with reviewed Shop Drawings and manufacturer's written instructions.

.2 Install steel stud partitions to underside of structure unless indicated otherwise.

.3 Install track runners at floors, ceilings, and underside of structure; align track runners accurately and secure to structure at 600 mm centres maximum.

.4 Install double top track runner assembly to prevent the transmission of structural loads to steel studs.

.5 Install steel studs vertically at 400 mm o.c., unless otherwise indicated, and not more than 50 mm from abutting walls, at openings, and at each side of corners. Install studs securely to track runners.

.6 Schedule and coordinate steel framing installation with mechanical and electrical services installation.

.7 Install full height, double studs at door and service openings, fastened together and stiffened back to the structure to prevent vibration when doors close.

.8 Provide double studs boxed together at all openings, sill, head and jambs and at door jambs, fastened together and stiffened back to the structure to prevent vibration. At each opening exceeding 900 mm in width, double studs shall be 20 ga. extending to structure above, and adequately anchored at each end. Provide steel studs above and below openings spaced at 400 mm oc maximum. All metal stud partitions above doors and screens over 1220 mm wide shall be secured to structure over and reinforced with sway bracing to stabilize walls to prevent lateral movement.

.9 Erect three studs at corner and intermediate intersections of partitions. Space 50 mm apart and brace together with wired 19 mm channels.

.10 Stiffen partitions over 2440 mm high or 3000 mm long, or both, with horizontal bracing extended for full length of partitions. Provide one line of bracing in partitions. Space lines to provide equal unbraced panels. Provide bracing for portions of partitions over door openings in partitions over 3000 mm high, and bracing both above and below openings in partitions located no greater than 150 mm from top and bottom of opening, and extending two stud spaces beyond each edge of opening for both doors and windows. Wire tie or weld bracing to studs.

.11 Frame control joints using back to back double studs at abutting structural elements, at dissimilar backup interface, at dissimilar walls and ceilings, at structural expansion and control joints, at door and other openings, and at 9000 mm maximum spacing in continuous runs. Install control joint strips and secure in place.

.12 Install additional support framing at openings and cutouts for built-in equipment, upper cabinet support, access panels and similar items.

.13 Attach to framing adequate steel reinforcing members or an 1.2 MM (18 ga.) steel stud mounted horizontally and notched around furring members 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, miscellaneous metals, coat hooks, washroom accessories, handrail anchors, rub rails, grab bars, guards, wall-hung cabinets and fitments, shelving, curtain and drape tracks, miscellaneous specialties; Owner supplied equipment; and minor mechanical and electrical work. Heavy mechanical and electrical equipment shall be self-supporting in Divisions 21, 22, 23 and 26.

.14 Provide for support and incorporation of flush-mounted and recessed mechanical and electrical equipment and fixtures only after consultation and verification of methods with those performing the work of Divisions 21, 22, 23 and 26.

.15 Install cross bracing in accordance with the steel stud manufacturer's recommendations.

3.4 FIRE RATED ASSEMBLIES

.1 Install Products in fire rated assemblies in strict accordance with applicable ULC tested and approved designs.

.2 Stiffen fire rated walls over 3.66 m high, where linear length of wall is greater than 2.44 m between perpendicular wall supports, with diagonal bracing above the ceiling extending perpendicular to wall at a 45° angle to structure above. Locate diagonal bracing at maximum 2.44 m o.c.

.3 Where double layers of gypsum board are shown, and required for fire rating, screw first layer to studs and furring and laminate the second layer to the first using joint filler as an adhesive. Stagger joints between first and second layers.

3.5 BATT INSULATION

.1 Install fire-rated/acoustic insulation as required for Work of this Project in accordance with Section 07 21 00.

3.6 ACOUSTICAL SEALANT

.1 Install acoustical sealant to acoustically insulated partitions in accordance with manufacturer's written instructions and Contract Drawings.

.2 Install acoustical sealant under floor runner track, at partition perimeter both sides and at openings, cut-outs, and penetrations, and where partition abuts window frame, concealed from view in the final installation.

.3 Install firestop fill material behind fire rated acoustical sealant and provide firestop identification tag.

.4 Smooth acoustical sealant with trowel prior to skin forming.

3.7 **GYPSUM BOARD**

.1 Comply with ASTM C840. Install gypsum board in accordance with reviewed Shop Drawings and manufacturer's written instructions.

.2 Install gypsum board vertically or horizontally, whichever results in fewer end joints. Locate end joints over supporting members.

.3 Install gypsum board in lightly butted contact at edges and ends and with 1.6 mm maximum open space between boards; do not force gypsum board into place. Do not install imperfect, damaged or damp boards.

.4 Install gypsum board butting paired tapered edge joints, and mill-cut or field-cut end joints; do not place tapered edges against cut edges or ends.

.5 Install vertical joints minimum 300 mm from the jamb lines of openings and stagger vertical joints over different studs on opposite sides of partitions.

.6 Do not locate joints within 200 mm of corners or openings, except where control joints occur at jamb lines or where openings occur adjacent to corners. Where necessary, place a single vertical joint over the centre of wide openings.

.7 Install gypsum board over concrete and concrete masonry units with adhesive as recommended by gypsum board manufacturer where indicated on Drawings.

.8 Cut, drill and patch gypsum board as may be necessary to accommodate the work of other trades.

9. Fire Separations:
   1. Construct gypsum board assemblies, where located, in accordance with tested assemblies to obtain required or indicated fire rated assemblies. As a minimum fire separations shall consist of metal framing covered on both sides by fire-rated gypsum board.
   2. Install assemblies tightly to enclosing constructions to maintain integrity of the separations. Install casing beads at all perimeter edges.

3.8 **CEMENT BOARD**

.1 Apply cementitious board to framing, with screw fasteners and taped joints in accordance with manufacturers instructions.

.2 Pre-cut board to required sizes and make necessary cutouts. Fit ends and edges closely but not forced together.

.3 Fasten board to steel framing with rust proof self-drilling, self-threading case hardened screws at 200 mm oc for walls and 150 mm oc for suspended applications.

.4 Apply mesh tape centred over all joints and corners but not overlapped.

.5 Apply 3 mm minimum thick skim coat of latex fortified mortar uniformly over entire cementitious board surfaces. Leave surface smooth and flat to receive subsequent finish.

3.9 **SHAFTWALL LINER**

.1 Plan and lay out metal framing components to ensure that all wall sections are plumb and properly aligned.

.2 Install J-track along the ceiling line and vertically at columns and abutting partitions, positioning the long legs closest to the shaft, using powder actuated fasteners or other approved method. Secure each piece with the appropriate fasteners spaced a maximum 610 mm O.C.

.3 Attach J-track to the floor with fasteners spaced at 610 mm O.C.

.4 Install Shaftliner panels vertically. The leading edge of the first panel must be attached to the long leg of the vertical J-track with 41 mm Type S screws spaced 610 mm O.C. Secure the top and bottom edges using the same fasteners and spacing.

.5 Friction-fit C-H stud into the top and bottom tracks and slide it snugly against the Shaftliner panel. Make sure the edge of the board is in full contact with the centre web of the stud and covered by all the tabs.

.6 Place the next Shaftliner panel between the tabs and flange on the opposite side of the C-H stud and secure it to the top and bottom track with 41 mm Type S screws spaced 610 mm O.C.

.7 Install subsequent Shaftliner panels and C-H studs in the same manner. Check periodically to ensure they are plumb.

.8 At the end of a partition run, cut the last Shaftliner panel slightly narrower and shorter than the opening to facilitate installation.

.9 For walls exceeding 3.7 m in height, Shaftliner panel end joints shall fall alternately in the upper and lower 1/3 of the partition. Use a C-H stud placed horizontally between panels to secure each joint.

.10 Frame all cut openings in the shaft side with J-track, providing adequate structural support for openings over 1219 mm.

3.10 CORNER, CASING BEADS AND TRIMS

.1 Corner reinforcing bead: Install along all external angles, erect plumb, level and with a minimum of joints. Secure with screws at 225 mm o.c. apply filler over flanges flush with nose of the bead and extending at least 75 mm onto surface of board each side of corner. When filler dries, apply a thin coat of topping cement and blend onto adjoining surfaces.

.2 Casing bead: Install where wallboard butts against a surface having no trim concealing the juncture and where shown on drawings. Erect casing beads plumb or level, with minimum joints, and secure with screws at 300 mm o.c. apply filler over flange flush with bead and extending at least 75 mm onto surface of board. When dry, apply a thin coat of topping cement and blend onto adjoining surfaces.

.3 Recess channels and trim: Install recess channels and special metal trim where shown. Secure to substrate. Provide casing beads full height on wallboard edges at recess channels and metal trim.

.4 Mullion cap trim:

1. Install mullion cap trim in accordance with manufacturer's written instructions. Coordinate with applicable Sections as required for sizing and installation.
2. Measure and cut sound barrier wall end cap to proper lengths.
3. Notch around horizontal mullions, sills, or other obstructions leaving appropriate gap for differential movement between the sound barrier wall end cap and the obstruction.
4. Apply continuous bead of acoustical sealant to the unexposed side of extruded aluminum surface that will be in contact with the gypsum board edge.
5. Place sound barrier wall end cap on the vertical surface of the gypsum board partition wall and loosely install fasteners in the top and bottom slotted holes of the wall end cap.
6. Plumb the wall end cap leaving recommended gap spacing between the interior glass surface and the wall end cap. Foam gasket to be in contact with glass.
7. Tighten top and bottom fasteners to secure end cap.
8. Install additional fasteners at 300 mm on center, minimum.
9. Install snap cover to conceal fasteners.
10. Apply colour matched sealant at joints of dissimilar materials as required

3.11 JOINT TAPING AND FINISHING

.1 Install reinforcing tape and a minimum of 3 coats of joint compound over gypsum board joints, metal trim and accessories, and screw fasteners in accordance with the gypsum board manufacturer's instructions.

.2 Fill gaps between ,and any imperfections in, gypsum boards with joint compound, allow to dry, and sand smooth ready for painting.

.3 Install finished gypsum board work smooth, seamless, plumb, true, flush, and with square, plumb, and neat corners.

.4 Finish gypsum board in accordance with ASTM C840 to the following grades:

1. Level 0: No taping, finishing, or accessories required. Use above suspended ceilings and within other concealed spaces, unless the assembly is fire rated, sound rated, sound or smoke controlled, or unless the space serves as an air plenum.
2. Level 1: At joints and interior angles embed tape in joint compound. Leave surface free of excess joint compound. Tool marks and ridges are acceptable. Use above suspended ceilings and within other concealed spaces if the gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or the space serves as an air plenum.
3. Level 2: At joints and interior angles embed tape in joint compound with one separate coat of joint compound applied over joints, angles, fastener heads, and accessories. Use for water resistant gypsum board indicated for use as a substrate for ceramic tile.
4. Level 3: At joints and interior angles embed tape in joint compound with two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use where heavy grade wall coverings are the final decoration.
5. Level 4: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use for all locations except those indicated for other finish levels.
6. Level 5: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply a thin skim coat of joint compound, or a material manufactured especially for this purpose, to the entire surface. Leave surface smooth and free of tool marks and ridges. Use where semi-gloss or gloss finish coatings are the final decoration.

3.12 ACCESS DOORS

.1 Install access doors, supplied as part of other parts of the work, in accordance with manufacturer's written instructions.

3.13 SITE TOLERANCES

.1 Install metal support systems to ensure that, within a tolerance of +3 mm and -1.5 mm for plaster thickness, finish surfaces will be flat within 3 mm under a 3 m straightedge, and with no variation greater than 1.5 mm in any running 300 mm, and that surface planes shall be within 3 mm of dimensioned location.

3.14 REPAIR

1. Make good cut-outs for services and other work, fill in defective joints, holes and other depressions with joint compound.

2. Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatments.

3.15 **CLEANING**

1. After work is complete in adjacent areas, clean exposed surfaces of exposed trims and mullion caps, with suitable cleaner that will not harm or attack the finish.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for tile work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ANSI A108/A118/A136.1, Installation of Ceramic Tile.

.2 ANSI A137.1, Specifications for Ceramic Tile.

.3 ASTM C144, Specification for Aggregate for Masonry Mortar.

.4 CAN/CSA A3000, Cementitious Materials Compendium.

.5 CAN/CGSB 25.20, Surface Sealer for Floors.

.6 TTMAC Specification Guide 09300 Tile Installation Manual.

.7 TTMAC, Maintenance Guide.

1.3 **SUBMITTALS**

.1 Product data:
  .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
    .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations and warranties.
    .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
  .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
    .1 Tile layout, patterns, and colour arrangement.
    .2 Perimeter conditions, junctions with dissimilar materials.
    .3 Setting details.

.3 Samples:
  .1 Submit following sample panels in accordance with Section 01 33 00.
    .1 Each colour, texture, size, and pattern of tile.
    .2 Adhere tile samples to 400 x 400 x 12.5 mm thick cement board complete with selected grout colour in joints.

.4 Certificates: Submit manufacturer's certificates stating that materials supplied are in accordance with this specification.

.5 Closeout submittals: Submit recommended maintenance instructions and listing of recommended maintenance Products for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.4 QUALITY ASSURANCE

.1 Perform work of this Section by a company that is a member in good standing of the Terrazzo Tile and Marble Association of Canada with proven, acceptable experience on installations of similar complexity and scope.

.2 Mock-up:
- .1 Construct one mock-up each of tiled wall and floor in location acceptable to Consultant.
- .2 Demonstrating concealing and seamless appearance of access panel in tiled wall assembly.
- .3 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
- .4 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in adequate crates or containers with manufacturer’s name and product description clearly marked.

.2 Handle and store tiles in a manner to avoid chipping, breakage or the instruction of foreign matter. Take precautions to protect the mortar and grout admixtures from freezing or from excessive heat.

1.6 SITE CONDITIONS

.1 Do not install work of this Section outside of the following environmental ranges without the Consultant's and Product manufacturer's written acceptance:
- .1 Ambient air and surface temperature: 15^0C to 45^0C.
- .2 Precipitation: None.

.2 Install temporary protection and facilities to maintain the Product manufacturer's, and specified, environmental requirements for 7 Days before, during, and 7 Days after installation.

1.7 MAINTENANCE

.1 Submit extra tile amounting to 5% of gross area covered, allowing proportionately for each pattern and type specified and which are part of the same Production run as installed Products. Store maintenance Products as directed by the Consultant.

2 Products

2.1 **MATERIALS**

.1 General: All materials under work of this Section, including but not limited to, sealants, adhesives, and sealers are to have low VOC content limits.

.2 Tile:
- .1 To ANSI A137.1.
- .2 Supply coves, caps, inside and outside corners and bullnose tile as required.
- .3 Where unfinished tile edge is exposed, supply cap to Consultant's selection.
- .4 Tile types (CT):
  - .1 Porcelain tile (CT1): Unglazed mosaic porcelain tile, sized at 25 x 25 mm, 'Mosaic Colourbody Porcelain Keystones Group' by Daltile or approved alternative. Colour: 'Lime Sherbet (D619)'. Cove to match CT1.
  - .2 Porcelain tile (CT2): Unglazed mosaic porcelain tile, sized at 150 x 600 mm with gloss finish, 'Architecture KOOL' by Stone Tile International or approved alternative. Colour: 'Acid Green'.
  - .3 Porcelain tile (CT3): Unglazed mosaic porcelain tile, sized at 50 x 250 mm with glossy finish, 'Farrow Dorset' by Estudio Ceramico (Stone Tile International) or approved alternative. Colour: 'White Glossy'.

.3 Tile base: Tile base to match floor tile. Height as shown.

.4 Ceramic soap dish (SDSH): To match colour of tile, recessed type, to later selection by Consultant.

.5 Floor divider strip: Stainless steel edge, continuous at all exposed tile edges, depth as required to suit tile thickness. 'Schiene-E' by Schluter Systems or approved alternative.

.6 Wall edge protection: Aluminum edge protection with trapezoid-perforated anchoring leg and an anodized finish, continuous at all exposed tile edges of wall corners as required and where indicated on Contract Drawings, depth as required to suit tile thickness. 'Jolly' by Schluter Systems or approved alternative.

2.2 **ACCESSORIES**

.1 Cement: CAN/CSA A3000, Type GU.

.2 Sand: ASTM C144.

.3 Water: Potable and free of minerals and other contaminants which are detrimental to mortar and grout mixes.

.4 Polymer additives: Keralastic by Mapei Inc or approved alternative by Ardex, Flextile Ltd. or Laticrete International.

.5 Thin-set mortar: 2 component to ANSI A108/A118/A136.1:
- .1 'Kerabond with Keralastic Latex Additive' by Mapei Inc., 'Ardex X77 Microtec' by Ardex, '56SR/51 w/44' by Flextile Ltd., or '254/255' by Laticrete International.
- .2 White coloured mortar shall be provided at appropriate tile types including, but not limited to; glass tile, light coloured marble, green marble and light coloured granite.

.6 Thick bed sloped topping: Factory mixed blend of portland cement and aggregates with latex admix. 'Ardex X32 Microtec' by Ardex, '226 thick bed mortar with 3701 admix' by Laticrete, or 'Topcem with Planicrete AC Admixture' by Mapei Inc.

.7 Primer: To meet specified requirements of adhesive manufacturer.

.8 Cleaner: In accordance with TTMAC's requirements and as recommended by tile manufacturer.

.9 Decoupling (crack isolation)/waterproofing membrane (wood subfloor): 3 mm thick, orange, high-density polyethylene membrane with a grid structure of 13 x 13 mm square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its underside. 'Ditra XL' by Schluter Systems or approved alternative.

.10 Crack-isolation system (concrete slab): Flexible, thin, fabric-reinforced, peel and stick membrane meeting ANSI A118.12 cut into strips to suit joints. 'Mapeguard 2' by Mapei Inc., or approved alternative by Ardex, Laticrete International Inc. or approved alternative manufacturer. Provide manufacturer approved primer.

.11 Waterproof membrane (concrete slab): Waterproof membrane system made from black, cold-applied, self-curing, liquid rubber polymer and an integral reinforcing fabric.'9235 Waterproofing' by Laticrete International Inc. or approved alternative by Mapei Inc. or approved alternative manufacturer.

.12 Grout:
- .1 Floors and bases (below 3 mm joint width): 'Keracolor U' by Mapei Inc. or approved alternative by Ardex, Flextile Ltd. or Laticrete International.
- .2 Floors and bases (3 mm to 10 mm joint width): 'UltraColor Plus' by Mapei Inc. or approved alternative by Ardex, Flextile Ltd. or Laticrete International.
- .3 Walls (1.5 mm to 3 mm joint width): 'Keracolor U' by Mapei Inc. or approved alternative by Ardex, Flextile Ltd. or Laticrete International.
- .4 Walls (over 3 mm joint width): 'Ultracolour Plus' by Mapei Inc. or approved alternative by Ardex, Flextile Ltd. or Laticrete International.
- .5 Grout colour: To be selected by the Consultant from the manufacturer's full colour range.

.13 Epoxy grout (showers and washrooms):
- .1 ANSI A108/A118/A136.1, Non-sag additive for work on vertical surfaces, Epoxy grout material shall be non-toxic, low odour, water cleanable and stain resistant. 'Ardex WA' by Ardex, '110 flex' by Flextile Ltd., 'Kerapoxy CQ' by Mapei Inc., 'Spectralock' by Laticrete International.

.2 Grout colour: To be selected by the Consultant from the manufacturer's full colour range.

.14 Sealer: CAN/CGSB-25.20, penetrating, type as recommended by tile manufacturer.

.15 Tile sealant: In accordance with Section 07 92 00.

.16 Cementitious skim/leveller coats:
.1 Where tile is applied to concrete or masonry wall surfaces, tile subcontractor is responsible for preparing intended substrates to acceptable tolerances with necessary cementitious skim/leveller coats.
.2 Cementitious trowel-grade compound for filling areas, 'Ardex CP' by Ardex or approved alternatives by Flextile Ltd., Laticrete International Inc. or Mapei Inc.

.17 Cementitious topping (wood subfloors): Cementitious topping in accordance with Section 03 51 13, to be applied to wood subfloor prior to application of tile flooring.

2.3 **MIXES**

.1 Levelling bed mix:
.1 1 part Portland cement.
.2 4 parts sand.
.3 1 part water (including polymer additive), adjusted for water content of sand.
.4 1/10 part polymer additive.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **SURFACE PREPARATION**

.1 Clean and dry surfaces thoroughly. Remove oil, wax, grease, dust, dirt, paint, tar, primers, form release agents, curing compound, and other foreign material from substrate surfaces which may prevent or reduce adhesion.

.2 Neutralize any trace of strong acids or alkali from the substrate.

.3 Concrete and masonry wall substrates: Apply cementitious skim coat in accordance with manufacturer's written instructions and as required to achieve acceptable tolerances for wall tile application on concrete and masonry substrates.

3.3 CONTROL JOINTS

.1 Provide control, expansion and isolation joints in accordance with TTMAC specification 301MJ and as indicated on drawings. Install in locations indicated on drawings and specified herein.

.2 Continue control, construction, and cold joints in the structural substrate up through the tile finish, and align with mortar joints where possible. Review joint locations on Site with the Consultant.

.3 Install joint widths to match grout joint widths, except where a minimum width is indicated.

.4 Install control joints in the following typical locations:
- .1 Aligned over changes in type of substrate.
- .2 At the restraining perimeters such as walls and columns.
- .3 Interior areas (not subject to sunlight): 6 mm minimum width, at 7320 mm o.c. maximum.
- .4 Interior areas (subject to sunlight): 6 mm minimum width, at 3660 mm o.c maximum.
- .5 As indicated on the Contract Drawings.

.5 Seal control joints in accordance with Section 07 92 00.

3.4 LEVELLING TOPPING/BED

.1 Cementitious topping to be installed at wood subfloors in accordance with Section 03 51 13, complete and cured, prior to the installation of tile flooring.

.2 Install a levelling bed on uneven substrate surfaces, level and plumb substrates in accordance with the following tolerances:
- .1 Vertical surfaces: 3 mm in 2.4 m maximum .
- .2 Horizontal surfaces: 6 mm in 3 m from finished levels of the surface, or better.

.3 Clean structural substrate control joints and blow-clean with compressed air. Grout fill control joints flush to slab with levelling bed.

3.5 CRACK ISOLATION

.1 Crack isolation strips:
- .1 Apply crack-isolation system over shrinkage and non-structural hairline cracks and "spiderwebbing" cracks in structural concrete floor slabs or in concrete topping on structural concrete floor slabs.
- .2 Apply liberal coat of primer with brush or roller over cracks, slightly wider than width of membrane. Roll out enough membrane to cover crack; cut and embed while liquid is wet. Roll membrane to ensure adhesion.

3.6 DECOUPLING/WATERPROOFING MEMBRANE

.1 Sheet decoupling/waterproofing membrane:
- .1 Install sheet decoupling/waterproofing membrane at locations of wood subfloors, after application of cementitious topping under Section 03 51 13 has been completed and cured as required.
- .2 Apply thin set setting mortar to subfloor in accordance with manufacturer's written instructions.
- .3 Roll out membrane into mortar, overlapping sheets to details as recommended by membrane manufacturer.

3.7 LIQUID WATERPROOFING MEMBRANE

.1 Liquid waterproofing membrane: Apply with a trowel on prepared substrate to a total dry film thickness of 1.143 mm in accordance with manufacturer's printed directions. Carry up walls to 50 mm high.

3.8 GENERAL INSTALLATION REQUIREMENTS

.1 Install tiles in accordance with manufacturer's instructions and TTMAC Specification Guide 09300 Tile Installation Manual. Manufacturer's installation instructions govern over TTMAC Installation Manual.

.2 Lay out work to produce a symmetrical pattern with minimum amount of cutting. Ensure cut tile at room perimeter and at joints is not less than ½ full size.

.3 Install trim to be placed under tile in locations indicated on Drawings.

.4 Set tiles in place and rap or beat with a beating block as necessary to ensure a proper bond and to level surface. Align tile for uniform joints and allow to set until firm. Clean excess mortar from surface of tile with a wet cloth or sponge while mortar is fresh.

.5 Ensure following minimum mortar contact coverage to back of tiles. Contact must be evenly distributed to give full support of the tile.
- .1 98% for large format (305 mm x 305 mm or greater) interior applications.
- .2 90% for non-large format interior applications.
- .3 100% for shower applications.

.6 Adjust joints between units uniform, plumb, straight, even, and true, with adjacent tile flush. Align grout joints in both directions unless indicated otherwise.

.7 Align floor, base and wall grout joints.

.8 Install tile accessory fittings for a complete and fully coordinated tile assembly.

.9 Install wall tile full height unless indicated otherwise.

.10 Do not place tile, trim, and accessories over control, expansion, or isolation joints. Stop materials in either side on joints and provide control, expansion and isolation joints as specified.

.11 Cut and fit tile neatly around piping, fittings, joints, projections and around recesses items e.g. washroom accessories. Where surface mounted equipment and accessories are installed on tile surfaces, extend tile over surfaces. Cut edges smooth, even, and free from chipping; chipped and broken edges are not acceptable.

.12 Do not proceed with grouting until minimum 48 hours after tile has set, to prevent displacement of tiles.

.13 Apply grout in accordance with grout manufacturer's directions to produce watertight, filled joints without voids, cracks and excess grout. Thoroughly compact and tool floor grout. Finish grout flush to edge thickness of tile and remove excess grout with soft burlap or sponge moistened with clean water.

3.9 **CLEANING**

.1 Clean off excess grout with soft burlap or sponge moistened with clean water.

.2 Polish floor and wall tile after grout has cured in accordance with TTMAC recommendations in the Maintenance Guide; do not use acid for cleaning.

.3 Apply 2 coats of sealer to unglazed floor tile in accordance with sealer manufacturer’s printed directions.

.4 Re-point joints after cleaning as required to eliminate imperfections, then re-clean as necessary. Avoid scratching tile surfaces.

3.10 **JOINT BACKING AND TILE SEALANT**

.1 Install joint backing under sealant as necessary.

.2 Install tile sealant around piping and fittings extending through tiled surfaces.

.3 Seal tile control joints.

.4 Seal internal tile to tile junctions. Tool to a smooth, flush surface, free from air bubbles and contamination.

3.11 **PROTECTION**

.1 Prevent traffic over tiled areas, and protect tiled assemblies from weather, freezing, and water immersion, for 72 hours minimum, after final installation.

.2 Protect finished work such as but not limited to grout form staining due to ongoing work whether or not it has been approved by the Consultant.

.3 Prevent direct impact, vibration and heavy hammering on adjacent and opposite walls for 24 hours minimum, after final installation.

.4 Cover work temporarily with building paper properly lapped and taped at joints until work has been approved by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for acoustical ceilings work in accordance with the Contract Documents.

1.2 **REFERENCES**

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

.2 ASTM C635, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

.3 ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

.4 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.

.5 ASTM E1264, Classification for Acoustical Ceiling Products.

1.3 **DESIGN REQUIREMENTS**

.1 Design ceiling suspension systems in accordance with ASTM C636 and manufacturer's printed directions.

.2 Design tile ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority. Acoustic panel system is not designed to carry the weight of electrical equipment.

.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.4 Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures. Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.

.5 Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

1.4 **SUBMITTALS**

.1 Shop drawings:
  .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
    .1 Suspension system layout including hangers and supports for acoustic tile system.

.2 Acoustic panel system including suspension system, hangers, supports and panel sizes and locations.
.3 Conditions at abutting, intersecting, and penetrating construction.
.4 Dimensioned locations of lighting fixtures, diffusers, sprinkler heads and other items that pierce the ceiling plane.

.2 Samples:
.1 Submit following samples in accordance with Section 01 33 00:
.1 One full-size sample of each type of tile panels to be used.
.2 One of each type of suspension system members.

.3 Certificates: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.5 QUALITY ASSURANCE

.1 Mock-up:
.1 Construct one 3 m^2 mock-up for each type of ceiling system incorporating typical light fixture and other typical mechanical and electrical fixtures.
.2 Test the adequacy of the suspension system to support the fixtures without deflection of ceiling or failure of hanging wire anchorage. Supply copy of Test Results to Consultant.
.3 Change materials and installation methods if tests indicate proposed system is inadequate and re-test as necessary until system approved.
.4 Give early notice to Consultant and Mechanical and Electrical Trades and co-operate with them in selecting suitable location for sample ceiling and timing of installation and test.
.5 Do not commence general installation work until sample ceiling approved, then install ceiling to conform with approved samples.
.6 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.6 SITE CONDITIONS

.1 Do not install the work of this Section until:
.1 Mechanical and electrical work above the ceiling is complete.
.2 Relative humidity is below 80 %.
.3 Ventilation is adequate to remove excess moisture.
.4 Areas are closed and protected against weather, and maintained at no less than 10°C.

.2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and after installation.

1.7 **MAINTENANCE**

.1 Submit extra acoustic ceilings amounting to 2% of gross ceiling area, allowing proportionately for each pattern and type specified to nearest full carton. Submit Products which are part of same production run as installed Products. Store maintenance Products as directed by Consultant.

1.8 **DELIVERY, STORAGE AND HANDLING**

.1 Transport, handle and store material in manner to prevent warp, twist, damage to panel edges and surfaces in accordance with Manufacturer's recommendations.

.2 Any warped and/or damaged panels and trim shall be rejected and be replaced by new, straight, undamaged and acceptable material at no cost to Owner.

.3 Bent, twisted or otherwise damaged Tee grid suspension components shall not be used under any circumstances. Replace such damaged items with new undamaged material at no additional cost to Owner.

.4 Store material in warm, dry place away from water and the elements. Protect against undue loading stresses and shock.

.5 All packaged material shall be delivered in original manufacturers wrappers and containers with labels and seals intact. All cartons shall bear U.L. label.

2 Products

2.1 **MATERIALS**

.1 General: Wherever possible, acoustical ceiling tiles, steel suspension system and framing used in work of this Section are to contain recycled content.

.2 Galvanized steel sheet: ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.

.3 Main carrying channels: ASTM C645; Channels formed from galvanized steel sheet, 38 x 19 mm cold rolled.

.4 Subframing: ASTM C645; Channels formed from galvanized steel sheet, dimensions and spans as required.

.5 Hangers: 2.6 mm minimum diameter, galvanized steel wire.

.6 Tie wire: 1.6 mm minimum diameter, soft annealed galvanized steel wire.

.7 Concrete anchors: tie wire sleeve anchors, ‘Redi-Drive Anchors' by ITW Red Head or approved alternative.

.8 Wall mouldings and accessories, including but not limited to, corner caps, edge mouldings, panel hold over clip, metal closures, and trim. Finish and colour: same as main tees.

.9 Exposed main, cross tees, and relocatable cross tees: ASTM C635, 38 mm high steel, bulb tee design double steel web, rectangular single spans without exceeding a deflection of 1/360 of the span. Splices to be integral and reversible; cross tee interlocking into main tee. Colour and finish: Manufacturer's standard white.

.1 15/16" suspension system:

.1 'Donn DX/DXL' by CGC Inc.

.2 or approved alternatives by Armstrong World Industries Inc., Certainteed Ceilings Canada or Rockfon/Chicago Metallic.

.10 Acoustic tile (LAP): ASTM E1264, type IV, Form 1 & 2, Pattern E & G. Wet-formed mineral fiber with antimicrobial additive and factory applied vinyl latex paint. 610 x 1220 x 19 mm thick square edge, 'Mars ClimaPlus' as manufactured by CGC Inc. or approved alternatives by Armstrong World Industries Inc., Certainteed Ceilings Canada or Rockfon/Chicago Metallic.

.11 Wall mouldings:

.1 W ceiling trim: Formed from extruded aluminum alloy 6063 T5, for wall at ceiling acoustical molding, 'WDM-50-50-625' by manufactured by Fry Reglet or approved alternative.

.2 Gypsum board/acoustical ceiling juncture: Coordinate with Section 09 21 16 for wall moldings at junctures with gypsum board ceilings.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 SUSPENSION SYSTEM

.1 Coordinate locations and openings of mechanical and electrical services support, and penetration through the acoustical ceilings. Coordinate field conditions, clearances, measurements, and mechanical and electrical services testing and commissioning, above the acoustical ceilings.

.2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.

.3 Install acoustical ceiling systems in accordance with manufacturer's written instructions, reviewed shop drawings, and ASTM C636, listed in order of precedence.

.4 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.

.5 Install additional hangers at lighting fixture and air distribution ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.

.6 Install acoustical ceiling suspension system to a tolerance of 1:1200 of span and 0.4 mm maximum between adjacent metal members. Tolerances are not cumulative. Refer to Electrical Contract Drawings for fixture layout.

.7 Do not bend or twist hangers as a means of levelling. Form double loops tightly and lock to prevent vertical movement or rotation within the loop.

.8 Install reveal moulding at intersection of ceiling and vertical surfaces.

.9 Centre acoustical ceiling suspension systems on room axis; install equal border pieces. Install hangers onto the ends of main tee runners at not more than 150 mm from ends of runners, adjacent and perpendicular to walls.

.10 Support the suspension system independently of walls, columns, ducts, pipes and conduits.

.11 Install main runners in maximum available lengths. Layout joints in suspension members to avoid the perimeters of recessed fixtures. Lock grid members to form a rigid assembly. Install additional tee, suspension system framing around recessed fixtures, diffusers, grilles and other items for a complete assembly.

3.3 ACOUSTIC LAY-IN TILES

.1 Install acoustic tile in grid system openings supported by bottom flanges of members. Provide special shapes and sizes to provide a complete installation by cutting tile to fit into openings. Fit tile moderately tight between upright legs of members.

.2 Carefully cut and trim acoustic tiles to accommodate items piercing the finished ceiling plane.

.3 Remove and replace acoustic tiles with broken edges, or damaged, marked, discoloured, soiled, or stained faces.

3.4 ADJUSTMENTS AND CLEANING

.1 Clean soiled or discoloured surfaces of exposed work on completion of work.

.2 Replace components which are visibly damaged, marred or uncleanable.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for resilient flooring work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM D2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

.2 ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

.3 ASTM F970, Standard Test Method for Static Load Limit.

.4 ASTM F1066, Specification for Vinyl Composition Floor Tile.

.5 ASTM F1344, Standard Specification for Rubber Floor Tile.

.6 ASTM F1482, Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring.

.7 ASTM F1516, Standard Practice for Sealing Seams of Resilient Floor Products by the Heat Weld Method.

.8 ASTM F1861, Specification for Resilient Wall Base.

.9 ASTM F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

.10 ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes.

.11 ASTM F2034, Standard Specification for Sheet Linoleum Floor Covering.

.12 CAN/ULC-S102.2-M, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

.13 ISO 717-2, Acoustics - Rating of Sound Insulation in Buildings and of Building Elements - Part 2: Impact Sound Insulation.

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings and methodology:
- .1 Submit shop drawings and surface preparation methodology in accordance with Section 01 33 00.
- .2 Submit shop drawings indicating seam layout and welding procedures for sheet material.
- .3 Submit surface preparation methodology of plywood subfloor, treatment of joints, fasteners and penetrations for the Consultant's review.

.3 Layout pattern: Submit brick type pattern for VCT flooring installation in accordance with Section 01 33 00 for the Consultant' approval.

.4 Samples:
- .1 Submit samples in accordance with Section 01 33 00:
  - .1 Submit two 250 x 200 mm samples of each type of sheet material and colour.
  - .2 Two 250 x 200 mm samples of each type of tile material and colour.
  - .3 Two 250 mm long samples of each base, accessory and colour.
  - .4 Submit two 150 mm x 150 mm samples of flash cove base representative of riser height and toe lengths specified, and shall represent one completed inside corner and one completed outside corner, with seams sealed and finished. Produce flash cove base samples in specified flooring materials and selected colours.

.5 Closeout submittals: Submit maintenance and cleaning data for incorporating into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.4 **QUALITY ASSURANCE**

.1 Installers qualifications (prefabricated flash cove bases): Perform work of this Section by a company that has a minimum of five years proven experience in the installation of prefabricated flash cove bases of a similar size and nature and that is approved by manufacturer. Submit to Consultant, installer's current certificate of approval by the material manufacturer as proof of compliance.

.2 Mock-up:
- .1 Construct one 3 m^2 mock-up each resilient flooring in location acceptable to Consultant.
- .2 Demonstrate surface preparation and workmanship of each resilient flooring over plywood subfloor sheathing and lack of telegraphing of joints or fasteners in final installation.

.3 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
.4 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
.5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.5 **SITE CONDITIONS**

.1 Maintain air temperature and structural base temperature at flooring installation area above 20°C for 48 hr before, during and 48 hr after installation.

.2 Store materials for 2 days prior to installation in area of Work to achieve temperature stability.

.3 Do not lay flooring in conditions of high humidity or where exposed to cold drafts. In hot weather, protect from direct sunlight.

.4 Provide adequate ventilation during installation.

1.6 **EXTENDED WARRANTY**

.1 Manufacturer’s warranty:
.1 Resilient sheet flooring: Provide flooring manufacturer’s warranty naming Owner as beneficiary, covering excessive wear for a period of 5 years from the date Work is certified as Substantially Performed.
.2 Prefabricated flash cove base: Warrant prefabricated flash cove base for lifetime against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner. Defects include but are not limited to punctures through aluminum backing at cove radius provided prefabricated flash cove base was installed professionally in accordance with manufacturer's written specifications.

1.7 **MAINTENANCE**

.1 Submit extra 5% of each colour, pattern and type of flooring material and bases required for maintenance use. Identify each roll or carton. Store where directed. Submit maintenance material in one piece and of same production run as installed materials.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, primers and adhesives are to have low VOC content limits.

.2 Linoleum sheet flooring (RSF):
- .1 Conforming to ASTM F2034, Type 1, 2.5 mm thick, homogeneous resilient flooring, made from natural ingredients, mixed and calendared onto a natural jute backing.
- .2 Flame spread: 150 to CAN/ULC-S102.2-M.
- .3 Smoke developed: 160 to CAN/ULC-S102.2-M.
- .4 Impact sound reduction: when tested to ISO 717/2, 6 dB.
- .5 Slip resistance: Static coefficient of slip resistance meets or exceeds 0.6 when tested in accordance with ASTM D2047.
- .6 Static load limit: 450 pounds per square inch when tested in accordance with ASTM F970.
- .7 Resilient flooring types and colours:
  - .1 RSF1: ‘Green Wellness (3881)’.
  - .2 RSF2: ‘Silver Birch (3871)’.
- .8 Acceptable products and manufacturers: 'Marmoleum Fresco' by Forbo Flooring.

.3 Vinyl composition tile (VCT): ASTM F1066, Class 2, minimum 305 x 305 x 3.0 mm thick, in colour selected by Consultant from manufacturer’s full colour range:
- .1 ‘Excelon Vinyl Composite Tile’ by Armstrong World Industries Canada Ltd.
- .2 ‘Commercial Vinyl Composition Floor Tile’ by Flextile Ltd.
- .3 ‘Tractionstep’ by Forbo Flooring.

.4 Prefabricated integral cove base:
- .1 Prefabricated Flash Cove Bases:
  - .1 Fabricated from same material and dye lots as resilient sheet flooring types as specified, in maximum practical lengths, with 38 mm x 38 mm formed aluminum reinforcing bonded to back of base material. Height: 100 mm high, unless otherwise indicated.
  - .2 ‘FlashCove Prefabricated Bases’ by FlashCove Prefabricated Bases Inc. or approved alternative.
- .2 Metal end caps: Provide J-trim type metal end caps for all cove bases. For adhesive installation; stainless steel cap; ‘Chiklet Cap’ by FlashCove Prefabricated Bases Inc. or approved alternative.
- .3 Clear silicone sealant for use at flash cove cap and wainscot panels shall be in accordance with Section 07 92 00.

.5 Rubber base (RB): ASTM F1861, Type TP, Group 1, rubber wall base, approximately 100 mm high x 6 mm thick toeless, tapered wedge, in lengths as long as possible including premoulded end stops and inner and outer corners. Colour: As selected by Consultant. ‘TightLock Carpet and Resilient Wall Base’ by Johnsonite or approved alternative.

.6 Stair treads and risers (RT):
- .1 Integrated rubber stair tread and riser for visually impaired with hammered surface texture, with 50 mm hinged nose configuration, tread tapering from 5.33 mm to 3.89 mm and 50 mm wide contrasting colour grit tape insert, ‘Hammered Tread/Riser for Visually Impaired (VIHTR)’ by Johnsonite or approved alternative.
- .2 Colours:
  - .1 Colour of rubber tread/riser: ‘Clay WB (09)’.

.2 Colour of insert: ‘Black (40)’.

.7 Tactile warning surface indicator tile (TWSI) :
.1 ASTM F1344, rubber tactile warning tiles with truncated dome, sized at 600 x 600 mm, ‘Safe Sense Tactile Walking Surface Indicators (TWSI)’ by Johnsonite or approved alternative.
.2 Colour and texture: To match hammered surface texture and colour ‘Clay WB (09)’ of integral stair tread/riser (RT).

.8 Rubber stair landing tile (RTL) :
.1 ASTM F1344, 3 mm thick, rubber solid tiles, sized at 600 x 600 mm, ‘Rubber Solid Tile (HRTS)’ by Johnsonite or approved alternative.
.2 Colour and texture: To match hammered surface texture and colour ‘Clay WB (09)’.

.9 Welding rod: type recommended by flooring manufacturer to complement flooring.

.10 Primers and adhesives: Low VOC, waterproof, of types recommended by flooring and base manufacturer for specific material on applicable substrate, above, on or below grade.

.11 Reducing edge strips, thresholds: Nitrile rubber plasticized vinyl, 80-95 Shore A Durometer, adhesive as recommended by manufacturer.

.12 Skim coat compound: High-performance, rapid-setting cement based skim coating compound. 'Ultra SkimCoat' by Mapei or approved alternative for filling minor voids and leveling existing concrete and wood subfloor.

.13 Stain sealer and polish: Provide sealer and polish as recommended by flooring manufacturer.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 SUBFLOOR TREATMENT

.1 Prepare intended subfloors and elevator cab floors in accordance with manufacturer’s written instructions.

.2 Coordinate with Section 14 21 23 as required for installation of resilient flooring material into elevator cab floors.

.3 Concrete subfloors:
- .1 Flooring material installed over concrete subfloors shall conform to ASTM F710.
- .2 Ensure concrete floors meet the following minimum requirements and requirements of the flooring manufacturer. If there is a conflict between these requirements and those of the flooring manufacturer, the more stringent shall apply.
  - .1 Internal Relative Humidity Test: Perform internal relative humidity testing in accordance with ASTM F2170. Results shall not exceed 80% RH.
  - .2 Moisture Test: Moisture emissions from concrete subfloors (cured for a minimum of 28 days) must not exceed 3 lbs per 1000sf per 24 hours (1.4 kg H2O/24 hr/93 m2) for acrylic adhesive and 5lbs for polyurethane adhesive via the Calcium Chloride Test Method (ASTM F1869).
  - .3 The pH level of the subfloor surface shall not be higher than 9.9. If higher, subfloor must be neutralized.

.4 Wood subfloors:
- .1 Prepare wood subfloors in accordance with manufacturer's written instructions and requirements of ASTM F1482.
- .2 Underlayment sheathing panels shall be acclimated to site conditions as recommended by sheathing manufacturer
- .3 Prepare floor sheathing joints and screw fasteners and penetrations as recommended by flooring manufacturer and to Consultant approved methodology.
- .4 Plywood sheathing must be free of any foreign material that may prohibit a secure bond or cause the discolouration of resilient flooring.

.5 Ensure that sub-floors have been provided as specified without holes, protrusions, cracks, depressions or other major defects.

.6 Remove sub-floor ridges and bumps on subfloors. Fill low spots, cracks, joints, holes and other defects with sub-floor filler as required for subfloors.

.7 Apply sub-floor filler to low spots and cracks to achieve floor level to a tolerance of 1:1000, allow to cure.

.8 Ensure that control joints have been filled and levelled.

.9 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this Section.

.10 Clean and remove all deleterious materials from subfloor and cab surfaces to receive this work in accordance with the adhesive manufacturer's recommendations.

.11 Prime subfloors and cab floors to flooring manufacturer's printed instructions.

3.3 RESILIENT SHEET FLOORING APPLICATION

.1 Install resilient sheet flooring in accordance with manufacturer's written instructions.

.2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturers instructions. Do not spread more adhesive that can be covered by flooring before initial set takes place.

.3 Run sheets in direction of traffic. Double cut sheet joints and continuously seal according to manufacturer's printed instructions. Remove adhesive seepage of seams or surface while adhesive is still wet.

.4 Heat weld seams in accordance with ASTM F1516 and manufacturer's printed instructions.

.5 As installation progresses and after installation, roll flooring with minimum 45 kg roller to ensure full adhesion.

.6 Cut flooring neatly around fixed objects.

.7 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.

.8 Install reducing edge strips at unprotected or exposed edges where flooring terminates or where there are two finishes of different thicknesses.

.9 Prefabricated flash cove base:

.1 Install prefabricated flash cove base in accordance with manufacturer’s written instructions.

.2 Provide integral coved base at room perimeter and at built-in fitment locations complete with accessories as required for complete and secure installation.

.3 Dry-fit prefabricated flash cove base; cut and fit material to required lengths. Mitre-cut inside and outside corners.

.4 Dry-fit and cut cove cap prior to prefabricated flash cove base installation.

.5 Scribe glue line on walls and floor at edge of prefabricated flash cove base material.

.6 Apply adhesive in full spread (100% coverage on 2 surfaces) for full length of prefabricated flash cove base material. Apply prefabricated flash cove base to wall surface straight and level.

.7 Slide base cap behind prefabricated flash cove base material.

.8 Hand roll prefabricated flash cove base material onto wall and floor surface removing bumps, ripples and fishmouths. Remove excess adhesive.

.9 Heat weld prefabricated flash cove base material vertical and horizontal seams and ends of open coves at termination points, such as at door openings and others.

.10 Provide continuous clear silicone sealant at juncture of flash cove cap and wainscot panels as shown on Contract Drawings. Clear silicone sealant shall be in accordance with Section 07 92 00.

3.4 RESILIENT TILE FLOORING APPLICATION

.1 Install resilient tile flooring in accordance with manufacturer’s written instructions.

.2 Install flooring in brick type pattern approved by the Consultant.

.3 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive that can be covered by flooring before initial set takes place.

.4 Lay flooring with joints straight and parallel to building lines to produce symmetrical tile pattern. Install equal size perimeter tile on each side.

.5 As installation progresses, and after installation, roll flooring in 2 directions with minimum 45 kg minimum roller to ensure full adhesion.

.6 Remove adhesive seepage at seams or surface while adhesive is still wet, in accordance with manufacturer's recommendation.

.7 Cut tile and fit neatly around fixed objects.

.8 Install feature strips and floor markings where indicated. Fit joints tightly.

.9 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.

.10 Install reducing edge strips at unprotected or exposed edges where flooring terminates and at edges where there are two finishes of different thicknesses.

3.5 RESILIENT BASE APPLICATION

.1 Install resilient base in accordance with manufacturer’s written instructions.

.2 Lay out base to keep number of joints at minimum.

.3 Prior to installing base, fill cracks and irregularities with a filler recommended by base manufacturer.

.4 Set base in adhesive using a 3 kg hand roller, against wall and floor surfaces.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions.

.7 Cope internal corners.

3.6 RUBBER STAIR TREADS/RISERS

.1 Prepare adhesive and install materials in accordance with manufacturer’s written instructions.

.2 Stair treads/risers: Pre-cut and fit treads prior to spreading adhesive. Fill back side of tread nose with a caulking bead; brush on adhesive on understeps and back of treads, as well as back of risers, and on receiving substrate. Allow to become tacky to touch before installing. Treads shall be fully bonded to substrate, with tread nosing butted tight against stair tread nosing. Roll with hand roller after installation.

.3 Remove adhesive seepage at seams or surface while adhesive is still wet, in accordance with manufacturer's recommendations.

3.7 **TACTILE WARNING TILES**

.1 Prepare adhesive and install materials in accordance with manufacturer's written instructions.

.2 Trowel adhesive evenly on substrate any lay tile with tight joints. Work from off the tile. If necessary to work on the tile, avoid shifting by using a kneeling board and by cutting tile to butt tightly at wall junctions.

.3 Roll tile both directions with manufacturer recommended roller when adhesive is tacky to touch. Use hand roller in areas inaccessible with large roller.

.4 Remove adhesive seepage at seams or surface while adhesive is still wet, in accordance with manufacturer's recommendations.

3.8 **RUBBER LANDING TILES**

.1 Prepare adhesive and install materials in accordance with manufacturer's written instructions.

.2 Trowel adhesive evenly on substrate any lay tile with tight joints. Work from off the tile. If necessary to work on the tile, avoid shifting by using a kneeling board and by cutting tile to butt tightly at wall junctions.

.3 Roll tile both directions with 68 kg sectional roller when adhesive is tacky to touch. Use hand roller in areas inaccessible with large roller.

.4 Remove adhesive seepage at seams or surface while adhesive is still wet, in accordance with manufacturer's recommendations.

3.9 **CLEANING AND SEALING**

.1 Forty-eight hours after installation, clean sheet flooring surfaces with a mild soap solution approved by finish manufacturer. Rinse clean and allow to dry.

.2 Apply stain sealer and allow to dry. Number of coats of sealer as recommended by flooring manufacturer and polish thoroughly.

3.10 **PROTECTION OF FINISHED WORK**

.1 Protect floors and bases from time of final set of adhesive until accepted by Consultant.

.2 Protect prefabricated flash cove bases from scratches, gouges, scuff marks and other damage from time initial surface protection application until final inspection.

.3 Prohibit traffic on floor for 48 hours after installation.

.4 Cover cleaned surfaces with fibre reinforced, clean, non-staining clean, kraft paper. Secure in position with gummed tape to prevent drifting. Remove covering when directed by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for waterproof flooring work in accordance with the Contract Documents.

1.2 **SUBMITTALS**

.1 Product data:
- .1 Submit manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, characteristics, limitations, preparation, and installation requirements and techniques.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop Drawings:
- .1 Submit Shop Drawings in accordance with Section 01 33 00 indicating:
  - .1 Sections, details, materials, thicknesses, finishes, joint layout and locations, and coating terminations.

.3 Samples: Submit two 300 x 300 mm samples, on cement board, of waterproof flooring in accordance with Section 01 33 00.

.4 Reports/certificates:
- .1 Submit manufacturer's written acceptance of substrate prior to installation. Submit verification of moisture content of floor prior to installation.
- .2 Submit applicator’s current certificate of approval, for installation of waterproof flooring, by the material manufacturer as proof of compliance.
- .3 Submit letter certifying that materials proposed for use on this project meet criteria specified, are compatible with each other, and that the manufacturer recommended the product for it’s intended end use.
- .4 Submit certification from waterproofing flooring manufacturer that installation meets specified and manufacturer’s requirements.

.5 Closeout submittals: Submit maintenance data for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.3 **QUALITY ASSURANCE**

.1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in waterproof flooring installations of a similar size and nature and that is approved by manufacturer.

.2 Mock-up:
- .1 Construct 2 m^2 mock-up of waterproof flooring in location acceptable to Consultant.
- .2 Mock-up shall demonstrate the minimum standard for workmanship, material thicknesses, surface profile, flashing, and juncture details, slip resistance, and finished appearance.
- .3 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
- .4 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

.3 Pre-installation meetings: Arrange with Consultant, manufacturer's representative, and waterproof flooring applicator to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.

.2 Store product in location protected from freezing, damage, construction activity, precipitation, and direct sunlight, in strict accordance with manufacturer's recommendations.

.3 Prior to application, condition products in accordance with manufacturer's recommendations.

.4 Handle all products with appropriate precautions and care as stated on Material Safety Data Sheet.

1.5 SITE CONDITIONS

.1 Do not install work of this Section outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:
- .1 Ambient air and surface temperature: 10^0C to 32^0C
- .2 Relative Humidity: 80%.
- .3 Moisture content of concrete is above 4% by weight of concrete.

.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 48 hours before, during, and 72 hours after installation.

2 Products

2.1 **MATERIALS**

.1 Waterproof flooring (WPF): Consisting of a flexible, liquid applied self priming unreinforced elastomeric polyurethane waterproofing membrane and a aliphatic wearing course with silica sand broadcast into the wear coarse for slip resistance. Colour to be selected by Consultant from manufacturer's standard colours. Waterproof floor system to include the following components:

.1 Waterproofing membrane (base coat): 'Sikalastic 710 NP Base' by Sika Canada Inc., 'Coelan Balcony Base' by Kemper System Canada, inc. or 'Vulkem 350' by Tremco Incorporated.

.2 Wearing course (top coat): 'Sikalastic 736 AL Lo-VOC Aliphatic Wearing Course' by Sika Canada Inc., 'Coelan Balcony Finish' by Kemper System Canada, Inc. or 'Vulkem 351' by Tremco Incorporated.

.3 Aggregate: Clean, rounded, oven dried quartz 30-40 mesh silica sand, or as recommended by waterproof floor system manufacturer.

.4 All primers, sealants, accessories, etc. necessary for a complete installation.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance.

.3 Verify that specified environmental conditions are ensured before commencing work.

.4 Test substrate surfaces to ensure that moisture level and acid-alkali balance does not exceed limits recommended manufacturer. Provide one copy of tests results to Consultant prior to installation.

3.2 **PREPARATION**

.1 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from work of this Section.

.2 Thoroughly clean all surfaces to receive coating by steel shotblasting or other method in accordance with manufacturer's written instructions.

.3 Remove projections and other conditions that may affect the installation of the coating.

.4 Fill open control joints, and other cracks and voids with material compatible with waterproof floor treatment materials.

.5 Clean prime and seal surfaces as recommended by waterproof flooring manufacturer.

3.3 **INSTALLATION**

.1 Install waterproof flooring in accordance with reviewed Shop Drawings and manufacturer's written instructions.

.2 Stop waterproofing flooring in a straight line on each side of control/expansion joints.

.3 Apply waterproof flooring with care to ensure that no laps, voids, or other marks or irregularities are visible, and with an appearance of uniform colour, sheen and texture, all within limitations of materials and areas concerned.

.4 Make clean true junctions with no visible overlap between adjoining applications of waterproof flooring.

.5 Chase edge of adjacent floor systems so that waterproof flooring finishes flush with adjacent floor systems.

.6 Broadcast aggregate into topcoat while still wet and backroll to evenly distribute and ensure encapsulation.

.7 At projections through floor post, pipes, vents and similar locations of potential movement, install a sealant bead and tool to form a cove and allow to cure prior to application of waterproof flooring.

.8 Apply waterproof flooring over entire floor areas and extend up vertical surfaces such as walls, columns and curbs to a height of 100 mm.

3.4 **REPAIR**

.1 Touch-up and refinish minor defective work. Refinish entire coated surface areas where finish is damaged or otherwise unacceptable.

3.5 **PROTECTION**

.1 Erect barriers to prevent the entry and presence of personnel not performing work of this Section during application of waterproof flooring, and for 48 hours following completion of application.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for concrete floor and wall sealer work in accordance with the Contract Drawings.

1.2 **SUBMITTALS**

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating:
- .1 Two copies of manufacturer's Product data on characteristics, performance criteria, and limitations.
- .2 Preparation, installation requirements and techniques, Product storage, and handling criteria.

.2 Samples: Submit samples in accordance with Section 01 33 00 indicating coating and final concrete finish.

.3 Reports: Submit manufacturer's acceptance of substrate prior to installation in writing. Submit verification of moisture content of floor prior to installation.

.4 Close-out submittals: Submit maintenance data for incorporation into Operations and Maintenance manuals in accordance with Section 01 78 23.

1.3 **QUALITY ASSURANCE**

.1 Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator’s current certificate of approval by the material manufacturer as proof of compliance.

.2 Mock-up:
- .1 Construct one 2 m^2 mock-up of floor sealer in location acceptable to Consultant.
- .2 Construct one 2 m^2 mock-up of wall sealer in location acceptable to Consultant.
- .3 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with Work.
- .4 Mock-up may remain as part of Work if accepted by Consultant. If sealer application is unacceptable to Consultant, rework sealer in accordance with manufacturer’s recommendations to provide a sealed concrete surface acceptable to Consultant.
- .5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

.3 Pre-installation meetings: Arrange with manufacturer's representative and Consultant to inspect substrates, and to review mock-up and installation procedures 48 hours in advance of installation.

1.4 **SITE CONDITIONS**

.1 Do not install the work of this Section outside of environmental ranges as recommended by the manufacturer without Product manufacturer's written acceptance and as follows:
.1 Relative Humidity: In accordance with manufacturers' requirements.
.2 When no dust is being raised.
.3 In well-ventilated and broom clean areas.

.2 Install temporary protection and facilities to maintain the Product manufacturer's, and the above specification, environmental requirements for 24 hours before, during, and 24 h after installation.

.3 Post do not enter and appropriate warning signs at conspicuous locations.

1.5 **DELIVERY, STORAGE, AND HANDLING**

.1 Store materials at site in an area specifically set aside for purpose that is locked, ventilated, and maintained at a minimum temperature of 16°C.

.2 Ensure that health and fire regulations are complied with in storage area, and during handling and application.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, sealers and coatings are to have low VOC content limits.

2. Each material used in the application of each flooring and wall system shall be as recommended or manufactured by the supplier of the flooring and wall system.

.3 Concrete floor sealer (CS, floor): Alkali-silicate, water-soluble, inorganic concrete hardener and dustproofer; ‘MasterKure HD 200WB’ by BASF Building Systems or approved alternative by Sika Canada Inc. or approved alternative manufacturer.

.4 Concrete wall sealer (CS, wall): Water-based, acrylic liquid polymer sealer and dustproofer; ‘MasterKure CC 200WB’ by BASF Building Systems or approved alternative by Sika Canada Inc. or approved alternative manufacturer.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Test surfaces for moisture content to ensure that they are suitable for application.

3.2 **PREPARATION**

.1 Prepare substrate in accordance with manufacturer's written instructions. Diamond grind and vacuum substrate free of debris and dust.

.2 Project adjacent surfaces from damage resulting from work of this Section. Mask and/or cover adjacent surfaces, fixtures, and equipment as necessary.

.3 Clean surfaces to be sealed as recommended by sealer manufacturer.

3.3 **APPLICATION**

.1 Apply concrete floor and wall sealer in accordance with manufacturer's written instructions. Sealer manufacturer shall supervise application.

.2 Comply with manufacturer recommended coverage rates to suit floor and wall applications.

.3 Floor sealer:
- .1 Spray apply concrete sealer to entire surface and keep from drying for 30 minutes as recommended by manufacturer.
- .2 Sprinkle surface with water as sealer begins to penetrate (after 30 minutes).
- .3 Flush surface with water and drying begins to remove excess material. Allow to harden for 24 hours.
- .4 Lightly buff floor with a commercial floor buffer and non-aggressive pad to bring up required sheen.
- .5 Apply second coat of concrete sealer following same procedures as first layer.

.4 Wall sealer:
- .1 Apply a continuous, uniform film by manufacturer recommended spray equipment or roller. Provide two coats.
- .2 Apply evenly and uniformly as soon as possible after final finishing.
- .3 Allow sealer to cure.

3.4 **CLEANING**

.1 Remove promptly as work progresses spilled or spattered materials from surfaces of work performed under other Sections. Clean floors and walls on completion of work. Do not mar surfaces while removing.

3.5 **PROTECTION**

.1 Erect barriers to prevent the entry and presence of personnel not performing work of this Section during application of floor and wall sealer, and for 48 hours following completion of application.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for painting work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 Master Painters Institute (MPI), Painting Specification Manual.

.2 SSPC Steel Structures Painting Council, Standards.

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.
- .2 Submit listing of manufacturer's Product types, Product codes, and Product names, number of coats, and dry film thicknesses, corresponding to each Painting Schedule code; submit listing minimum of 8 weeks before materials are required.

.2 Samples:
- .1 Submit following samples in accordance with Section 01 33 00.
  - .1 Three 300 x 150 mm draw downs of each colour minimum 4 weeks before paints are required.
  - .2 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.

.3 Certificates:
- .1 Submit certification from paint manufacturer, on company letterhead, indicating each product proposed for use is Manufacture's premium grade, first line Product.
- .2 Submit certified documentation to confirm each airless spray painter has minimum of 5 years experience on applications of similar complexity and scope.
- .3 Submit certified documentation to confirm each worker has Provincial Tradesman Qualification certificate of proficiency.

.4 Reports:
- .1 Submit written field inspection and test report results after each inspection.
- .2 Submit Field Quality Control test result reports for alkali content, substrate moisture, and dry film thickness.
- .3 Submit electronic moisture meter manufacturer's specifications including tolerances. Submit record of latest meter calibration to meet manufacturer's recommendations.

1.4 QUALITY ASSURANCE

.1 Finishing work: Perform work to MPI requirements for premium grade.

.2 Supervision: Have work supervised by a full-time qualified foreperson who has 10 years minimum experience on Contracts of similar complexity and scope.

.3 Mock-up:
- .1 Construct three 3 m^2 mock-ups of different Paint Schedule code systems, selected by Consultant, in locations acceptable to Consultant to demonstrate installation workmanship, colour, and hiding power of Products.
- .2 Obtain Consultant's acceptance in writing before proceeding with the work of this Section.
- .3 Mock-ups may remain as part of the Work if acceptable to Consultant and will serve as a standard for similar code systems.
- .4 Repaint over mock-ups which do not form part of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Install correct, safe temporary storage for paint, thinner, solvents, and other volatile, corrosive, hazardous, and explosive materials in accordance with requirements of authorities having jurisdiction.

.2 Post hazard warning signage in areas of storage and mixing. Install and maintain sufficient CO_2 fire extinguishers of minimum 9 kg capacity, accessible in each storage mixing and storage areas.

.3 Maintain storage enclosures at minimum 10°C ambient temperature and to manufacturer's instructions.

1.6 SITE CONDITIONS

.1 Apply coatings under the following conditions:
- .1 Exterior coatings (except Latex): 5° C minimum.
- .2 Exterior latex coatings: 10°C minimum.
- .3 24 hours minimum after rain, frost, condensation, or dew.
- .4 When no condensation is possible (unless specifically formulated against condensation).
- .5 Interior coatings: 7°C minimum.
- .6 Relative humidity: 85% maximum.
- .7 Not in direct exposure to sun light.

.2 Maintain temperature conditions indicated above for 24 hours before, during and 24 hours after painting.

.3 Install clean plywood sheets to protect floors and walls in storage and mixing areas, from paint drips, spatters, and spills.

.4 Apply sufficient masking, clean drop cloths, and protective coverings for full protection of work not being painted including, but not limited to, the following:
- .1 Light fixtures, fire and smoke detectors.
- .2 Sprinkler heads.
- .3 Prepainted diffusers and registers.
- .4 Prepainted equipment.
- .5 Fire rating labels and equipment specification plates.
- .6 Finished surfaces.

1.7 **ENVIRONMENTAL PERFORMANCE REQUIREMENTS**

1. Provide paint products meeting MPI "Green Performance Standard GPS-1-05".

1.8 **MAINTENANCE**

1. Deliver to Owner's place of storage on completion of work, sealed containers of each finish painting material applied, and in each colour. Label each container as for original, including mixing formula. Provide the following:
- .1 1 L of extra materials when less than 50 L are used for Project;
- .2 3.78 L of extra stock when 50 to 200 L are used;
- .3 7.57 L of extra stock when over 200 L are used.

2 Products

2.1 **MATERIALS**

.1 Paint:
- .1 All materials under work of this Section, including but not limited to, primers, stains, and paints are to have low VOC content limits.
- .2 Products in accordance with the MPI Painting Specification Manual, Exterior and Interior Systems;
  - .1 For each MPI paint code, manufacture's premium grade, first line Products is to be use.
  - .2 Uniform dispersion of pigment in a homogeneous mixture.
  - .3 Ready-mixed and tinted whenever possible.
- .3 Products within each MPI paint system code: From single manufacturer.
- .4 Acceptable manufacturers:
  - .1 Benjamin Moore.
  - .2 Dulux Paints/PPG.
  - .3 Sherwin Williams.

.2 Chalkboard paint: Acrylic-based topcoat applied to a minimum dry film thickness of 1.5 mils. Colour: To be selected by Consultant. ‘Chalkboard Paint K308' by Benjamin Moore or approved alternative.

.3 Wood sealer: Three coat wood sealer system as manufactured by Sikkens or approved alternative.
.1 Wood basecoat: One coat of translucent oil alkyd basecoat 'Cetol 1RE' by Sikkens.
.2 Wood topcoat: Two coats of 'Cetol 23RE' by Sikkens topcoat consisting of translucent alkyd resin and UV absorbers, clear coating and in colour as selected by the Consultant for intended exterior wood items.

.4 Exterior steel coatings: In accordance with Section 09 97 13.

.5 Exterior site finishing: Refer to Section 32 30 00 for additional exterior finishing scope.

2.2 PAINT TYPES, COLOUR AND GLOSS SCHEDULE

.1 Paint types (PT and EP), colours and gloss schedule:
.1 Consultant will select choice of colours and gloss when compiling a Colour Schedule after award of Contract.
.2 Allow for colour selection beyond paint manufacturer's standard colour range.
.3 Conform to gloss reflectance definitions listed in MPI Specification Manual.

2.3 PAINTING AND FINISHING SCHEDULE

.1 Refer to Table 1, MPI Painting and Finishing Schedule coded systems, comply with MPI Painting Specification Manual.

Table 1: Painting and Finishing Schedule

EXTERIOR SUBSTRATES	Typical substrates (Including but not limited to)	MPI Manual Ref.	MPI Finish System Code	Topcoat
Asphalt surfaces	Traffic/zone marking on drive and parking areas, white markings and blue and white barrier-free symbols	EXT 2.1	EXT 2.1B	Alkyd
Structural steel and metal fabrications (galvanized)	Galvanized structural steel columns, fences, beams, connectors, glazed guards, steel guards, PV steel canopy, play structure elements, etc.	N/A	N/A	In accordance with Section 09 97 13.

Galvanized steel	HM doors & frames, ladders	EXT 5.3	EXT 5.3L	Pigmented polyurethane
Aluminum	Exterior soffit vent	EXT 5.4	EXT 5.4B	Polyurethane, pigmented
Wood paneling and dimension lumber	Exterior wood items	N/A	N/A	See Note 1.
INTERIOR SUBSTRATES	Typical substrates (Including but not limited to)	MPI Manual Ref.	MPI Finish System Code	Topcoat
Concrete walls		INT 3.1	INT 3.1G	Epoxy-modified latex
Concrete block masonry		INT 4.2	INT 4.2D	High performance latex
Structural steel (Factory primed)	Steel columns	INT 5.1	INT 5.1R	High performance latex
Metal Fabrications (Factory primed)	Steel stairs, ladders	INT 5.1	INT 5.1R	High performance latex
Galvanized steel	Ducts, pipes	INT 5.3	INT 5.3A	Latex
Galvanized metal	HM doors & door frames, handrails	INT 5.3	INT 5.3M	High performance latex
Aluminum	Aluminum trims used in conjunction with gypsum board	INT 5.4	INT 5.3F	High performance latex
Dimension lumber	Exposed wood deck and wood structure	INT 6.2	INT 6.2J	Polyurethane
Dressed lumber	Frames (requiring paint finish)	INT 6.3	INT 6.3A	High performance latex

Dressed lumber, stain finish (ST)	Frames, sidelites, transoms, screens - requiring stain finish (ST)	INT 6.3	INT 6.3EE	Polyurethane varnish (over semi-transparent stain)
Wood paneling & casework	Millwork	INT 6.4	INT 6.4E	Polyurethane varnish
Wood paneling & casework	Marine grade plywood panels requiring chalkboard paint.	N/A	N/A	See Note 2.
Gypsum board,	Drywall, walls, ceilings	INT 9.2	INT 9.2B	High performance latex
Gypsum board, epoxy paint (EP)	Wet areas (washrooms, shower areas, mechanical rooms)	INT 9.2	INT 9.2F	Epoxy-modified latex

.2 Notes:

.1 Provide three coat wood sealer system consisting of one coat of the basecoat and two coats of topcoat specified herein and for intended exterior wood items. Apply sealer system in accordance with this specification and the manufacturers directions.

.2 Provide 2 coats of chalkboard paint specified herein in accordance with this specification and the manufacturers directions.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

.1 General:
- .1 Clean substrate surfaces free from, dust, grease, soiling, or extraneous matter, which are detrimental to finish.
- .2 Patch, repair, and smoothen minor substrate defects and deficiencies e.g. machine, tool and sand paper marks, shallow gouges, marks, and nibs.
- .3 Clean, sweep, and vacuum floors and surfaces to be painted, debris and dust-free prior to painting.
- .4 Refer to MPI Painting Specification Manual for surface preparation requirements of substrates not listed here.

.2 Where finish hardware has been installed remove, store, re-install finish hardware, to accommodate painting. Do not clean hardware with solvent that will remove permanent lacquer finishes.

.3 Alkali Content tests and neutralization:
- .1 Test for ph level using litmus paper on dampened substrate.
- .2 Neutralize surfaces over 8.5 ph with 4% solution of Zinc Sulphate for solvent based systems and tetrapotassium pyrophosphate for latex based systems, to below 8.0 ph, and allow to dry.
- .3 Brush-off any residual Zinc Sulphate crystals.
- .4 Coordinate paint system primer / sealer to be alkali-resistant.

.4 Substrate moisture tests:
- .1 Test for moisture content over entire surface to be painted, minimum one test/ 2 m^2 in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
- .2 If any test registers above 10% allow entire substrate surfaces, within the plane, to dry further before paint system application. Install temporary drying fans if necessary.
- .3 Re-test employing same criteria.

.5 Asphalt surfaces:
- .1 Surfaces must be dry and free from dust, dirt and any loose surface contamination.
- .2 Ensure that the asphalt pavement has had sufficient drying time.
- .3 Spray paint parking zone lines and other pavement markings indicated, included, but not limited to, hash marks for no parking areas, direction arrows and handicap parking symbols.
- .4 Use templates for symbols, arrows, lettering.
- .5 Unless otherwise indicated, paint lines 125 mm wide.
- .6 Paint lines straight, or uniformly curved, with well defined edges and full paint coverage in all locations.

.6 Cementitious and masonry (concrete, block):
- .1 Allow 28 days cure before painting.
- .2 Coordinate repair of protrusion-chipping and grinding, and honeycomb filling with responsible trades.
- .3 Remove dirt, loose mortar, scale, powder, efflorescence, and other foreign matter.

.4 Remove form oil and grease with trisodium phosphate, rinse, and allow to dry thoroughly.
.5 Remove rust stains with solution of sodium metasilicate after thorough wetting; allow to dry thoroughly.

.7 Aluminum (primed finish): Touch-up damaged primer and clean as required, then paint immediately.

.8 Galvanized steel sheet:
.1 Z275 (Satin & Spangled Sheet): SSPC SP7 brush blast.
.2 ZF075 (Wiped Coat): Remove contamination, wash with Xylene solvent.
.3 Touch-up damaged galvanized areas with organic zinc rich primer.

.9 Galvanized iron and steel: Prepare galvanized and ungalvanized metal surfaces as follows:
.1 Unpassivated, unweathered and weathered: Remove contamination, wash with Xylene or Toluol solvent, allow to dry thoroughly. Make paint system primer/sealer an etching type primer.
.2 Manufacturer pre-treated (including passivated): SSPC SP7.
.3 Touch-up damaged galvanized areas with organic zinc rich primer.

.10 Structural steel and miscellaneous metal fabrications:
.1 Coordinate the following with the responsible trades:
.1 Rust, mars, mill scale, and weld-burn touch-ups.
.2 Oil, grease, weld flux and other residue removal.
.2 Prime paint items, not otherwise indicated to be primed as part of another Section.
.3 Touch-up damaged galvanized areas with organic zinc rich primer.

.11 Wood and millwork:
.1 Wood surfaces to be clean and dry with a moisture content of less than 15%.
.2 Remove foreign matter prior to prime coat; spot coat knots, pitch streaks and sappy sections with sealer.
.3 Fill nail holes and fine cracks after primer has dried.
.4 Backprime interior and exterior woodwork.

.12 Factory primed surfaces:
.1 Touch up damaged areas.
.2 Clean as required for top coat.

.13 Gypsum board:
.1 Apply primer/sealer paint to reveal defects and deficiencies and to equalize absorption areas.
.2 Coordinate repairs and touch-ups with the responsible trade.
.3 Re-prime repairs.

.14 Coordinate with other trades to prevent:
.1 Damage, and inadvertent activation of fire and smoke detectors.
.2 Odour and dust distribution by permanent HVAC systems including fouling of ducts and filters.

.15 Field-mix Products in accordance with manufacturer's written instructions.

3.3 **APPLICATION**

.1 Apply painting systems in accordance with the MPI Painting Specification Manual. Apply each Product to manufacturer's recommended dry film thickness.

.2 Painting systems listed are required minima, apply additional coats if necessary to obtain substrate hiding acceptable to the Consultant.

.3 Tint intermediate coats lighter than final top coats for identification of each succeeding coat and to facilitate inspections. Include only manufacturer's recommended reducing and tinting accessories. Do not add adulterants.

.4 Primer to be specialized primer coating system as required by manufacturer for selected colour. Standard primer being tinted shall be tinted to a maximum of 1.5% by volume.

.5 Sand lightly between coats to achieve a tooth or anchor for subsequent coats.

.6 Apply paint uniformly in thickness, colour, texture, and gloss, as determined by the Consultant under adequate illumination and viewed at a distance of 1500 mm. Apply finishes free of defects in materials and application which, in the opinion of the Consultant, affect appearance and performance. Defects include, but are not limited to:
- .1 Improper cleaning and preparation of surfaces.
- .2 Entrapped dust, dirt, rust.
- .3 Alligatoring, blisters, peeling.
- .4 Scratches, blemishes.
- .5 Uneven coverage, misses, drips, runs, and poor cutting in.

.7 Do not apply coatings on substrates which are not sufficiently dry. Unless indicated otherwise, allow each painting system coat to cure dry and hard before following coats are applied.

.8 Repaint entire areas of damaged or incompletely covered surfaces, to the nearest inside or outside corner; patching will not be permitted.

.9 Miscellaneous painting requirements:
- .1 Paint projecting ledges, and tops, bottoms and sides of doors both above and below sight lines to match adjacent surfaces.
- .2 Paint door frames, access doors and frames, door grilles, prime coated butts, and prime coated door closers to match surface in which they occur.
- .3 Finish closets and alcoves as specified for adjoining rooms.
- .4 Paint light coves white whether a light lense is installed or not, unless otherwise indicated.
- .5 Paint interior columns to match walls of room.
- .6 Unless otherwise indicated, allow for:
  - .1 2 wall colours per room, one ceiling colour per room.
  - .2 Different door colours in each functionally different area.
  - .3 Different colours on both sides of same door.

.10 Mechanical, electrical and other painting coordination:
- .1 Paint mechanical services in accordance with Mechanical Identification Division 21, 22 and 23.
- .2 Coordinate painting of pipes, ducts, and coverings with the work of Division 21, 22 and 23 to precede pipe colour banding, flow arrows, and other pipe identification labeling installation.
- .3 Paint exposed conduit, pipes, hangers, ductwork, grilles, gratings, louvres, access panels, fire hose cabinets, registers, convector and radiator covers, enclosures, and other mechanical and electrical equipment including services concealed inside cupboard and cabinet work; apply colour and sheen to match adjacent surfaces, except as noted otherwise.
- .4 Paint portions of surfaces such as duct interiors, piping, ductwork, hangers, insulation, walls, and similar items, visible through grilles, louvres, convector covers etc., matte black in colour.
- .5 Remove the following to accommodate painting, carefully store, clean, then re-install on completion of each area and when dry:
  - .1 Switch and receptacle plates, fittings and fastenings, grilles, gratings, louvres, access panels, convector covers, and enclosures.

3.4 FIELD QUALITY CONTROL

.1 Dry film thickness tests:
- .1 Test for film thickness over entire surface to be painted, minimum one test/2 m^2 in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
- .2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.
- .3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Consultant, and repair as directed.
- .4 Re-test employing same criteria after repair.

3.5 CLEANING

.1 Remove spilled, splashed, and spattered paint promptly as work proceeds and on completion of work. Clean surfaces soiled by paint spillage and paint spatters. Repair or replace damaged work, as directed by Consultant.

3.6 PROTECTION

.1 Post Wet Paint signs during drying and restrict or prevent traffic where necessary.

.2 Post sign, after Consultant's inspection and acceptance of each room, reading: PAINTING COMPLETE - NO ADMITTANCE WITHOUT CONTRACTOR'S PERMISSION.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for anti-graffiti coating work in accordance with the Contract Drawings.

1.2 **SUBMITTALS**

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating manufacturer's Product data indicating characteristics, performance criteria, limitations, preparation, installation requirements and techniques, Product storage, and handling criteria.

.2 Reports: Submit manufacturer's acceptance of substrate prior to installation in writing. Submit verification of moisture content of substrate prior to installation.

.3 Close-out submittals: Submit maintenance data for incorporation into operation and maintenance manuals in accordance with Section 01 78 23.

1.3 **QUALITY ASSURANCE**

.1 Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.

.2 Mock-up:
- .1 Construct one 3 m^2 mock-up of anti-graffiti coating in location acceptable to Consultant.
- .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
- .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.4 **SITE CONDITIONS**

.1 Do not install the work of this Section outside of the following environmental ranges without Product manufacturer's written acceptance:
- .1 Ambient air and surface temperature: 4^0C to 38^0C.
- .2 Relative Humidity: In accordance with manufacturers' requirements.
- .3 When no dust is being raised.

.2 Install temporary protection and facilities to maintain the Product manufacturer's, and the above specification, environmental requirements for 24 hours before, during, and 24 h after installation.

.3 Post do not enter and appropriate warning signs at conspicuous locations.

1.5 **DELIVERY, STORAGE, AND HANDLING**

.1 Store materials at site in an area specifically set aside for purpose that is locked, ventilated, and maintained at a minimum temperature of 16°C.

.2 Ensure that health and fire regulations are complied with in storage area, and during handling and application.

2 Products

2.1 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, coatings are to have low VOC content limits.

2. Anti-graffiti coating: Water-borne, breathable, fluorosilane, low VOC coating; 'Protectosil Antigraffiti' by Evonik Industries and distributed by DRE Industries Inc. For use on fibre concrete panels.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Verify that concrete has cured 28 days minimum and that substrate is acceptable to coating manufacturer. Test surfaces for moisture content to ensure that they are suitable for application.

3.2 **PREPARATION**

.1 Prepare and clean substrates in accordance with manufacturer's written instructions.

.2 Project adjacent surfaces from damage resulting from this work. Mask and/or cover adjacent surfaces, fixtures, and equipment as necessary.

3.3 **APPLICATION**

.1 Apply, a minimum of 2 coats of, coating in accordance with manufacturer's printed instructions. Coating manufacturer shall supervise application.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for exterior steel coatings work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 CAN/CGSB 85.10, Protective Coatings for Metals.

.2 SSPC Steel Structures Painting Council, Standards.

.3 SSPC-SP1, Solvent Cleaning.

.4 SSPC-SP6, Commercial Blast Cleaning.

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.
- .2 Submit listing of manufacturer's Product types, Product codes, and Product names, number of coats, and dry film thicknesses, corresponding to each Painting Schedule code; submit listing minimum of 8 weeks before materials are required.

.2 Samples:
- .1 Submit following samples in accordance with Section 01 33 00.
  - .1 Three 300 x 150 mm draw downs of each colour minimum 4 weeks before paints are required.
  - .2 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.

.3 Certificates:
- .1 Submit certified documentation to confirm each airless spray painter has minimum of 5 years experience on applications of similar complexity and scope.
- .2 Submit certified documentation to confirm each worker has Provincial Tradesman Qualification certificate of proficiency.

.4 Reports:
- .1 Submit written field inspection and test report results after each inspection.
- .2 Submit Field Quality Control test result reports for alkali content, substrate moisture, and dry film thickness.
- .3 Submit electronic moisture meter manufacturer's specifications including tolerances. Submit record of latest meter calibration to meet manufacturer's recommendations.

.5 Closeout submittals: Submit maintenance instructions in accordance with Section 01 78 23 for incorporation into Operation and Maintenance Manual.

1.4 QUALITY ASSURANCE

.1 Applicators qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the application of coatings of a similar nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.

.2 Mock-up:
- .1 Construct three 2 m^2 mock-ups of different Paint Schedule code systems, selected by Consultant, in locations acceptable to Consultant to demonstrate installation workmanship, colour, and hiding power of Products.
- .2 Obtain Consultant's acceptance in writing before proceeding with the work of this Section.
- .3 Mock-ups may remain as part of the Work if acceptable to Consultant and will serve as a standard for similar code systems.
- .4 Repaint over mock-ups which do not form part of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Install correct, safe temporary storage for paint, thinner, solvents, and other volatile, corrosive, hazardous, and explosive materials in accordance with requirements of authorities having jurisdiction.

.2 Post hazard warning signage in areas of storage and mixing. Install and maintain sufficient CO^2 fire extinguishers of minimum 9 kg capacity, accessible in each storage mixing and storage areas.

.3 Maintain storage enclosures at minimum 10°C ambient temperature and to manufacturer's instructions.

1.6 SITE CONDITIONS

.1 Apply coatings under following conditions:
- .1 Exterior coatings: 5°C minimum.
- .2 24 hours minimum after rain, frost, condensation, or dew.
- .3 When no condensation is possible (unless specifically formulated against condensation).
- .4 Not in direct exposure to sun light.

.2 Maintain temperature conditions indicated above for 24 hours before, during and 24 hours after painting.

.3 Install clean plywood sheets to protect floors and walls in storage and mixing areas, from paint drips, spatters, and spills.

.4 Apply sufficient masking, clean drop cloths, and protective coverings for full protection of work not being painted such as:
- .1 Prepainted equipment.
- .2 Fire rating labels and equipment specification plates.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 All materials under work of this Section, including but not limited to, coatings are to have low VOC content limits.

.2 Each material used in the application of each coating system shall be as recommended or manufactured by the supplier of the coating and be in accordance to CAN/CGSB 85.10.

.3 Coating Formula:
- .1 One coat epoxy primer, minimum 2 mil (0.051 mm) to 3 mils (0.076 mm) dry film thickness. ‘Devran 201H Epoxy Primer' by Devoe High Performance Coatings (AkzoNobel) or ‘Amercoat Amerlock 2 High Solids Epoxy Coating’ by PPG Protective & Marine Coatings, minimum 4 mils (0.102 mm) to 8 mils (0.204 mm) dry film thickness.
- .2 Top coat: Minimum two (2) coats of 'Devthane 349QC Polyurethane' by Devoe High Performance Coatings (AkzoNobel), minimum 4 mils (0.102 mm) to 9 mils (0.230 mm) dry film thickness for each coat or ‘Amercoat 450H Acrylic Aliphatic Polyurethane’ by PPG Protective & Marine Coatings, minimum 2 mils (0.051 mm) to 5 mils (0.128 mm) dry film thickness per coat.
- .3 Colour: As selected by the Consultant.

2.2 **SHOP PAINTING**

.1 Preparation:
- .1 Prepare surfaces in accordance with manufacturer’s written instructions and specifications.
- .2 Clean steel prior to application of coating in accordance with Steel Structures Painting Council Standards published in Steel Structures Painting Manual, Vol. 2, Systems and Specifications.
- .3 Prior to abrasive blast cleaning, remove oil and grease in accordance with SSPC-SP1 Solvent Cleaning.
- .4 Prior to application of prime coat prepare steel surfaces in a manner as specified as SSPC-SP6 Commercial Blast Cleaning, to an average 2 mil profile.

.5 Cover or mask surfaces adjacent to those receiving coating to protect work of others and property from damage and soiling.

.2 Shop application:
- .1 Shop apply coating in accordance with coating manufacturer's written application instructions and specifications.
- .2 Apply coatings with no runs, laps, voids, or other marks or irregularities, and with uniform colour, sheen and texture.
- .3 Apply each successive coat only after the previous coat has dried.

.3 Refinish entire coated surface where finish is damaged or otherwise unacceptable. Surfaces exhibiting pin holes or other defects shall be recoated.

.4 Dry film thickness tests:
- .1 Test for film thickness over entire surface to be painted, minimum one test/2 m2 in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
- .2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.
- .3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Consultant, and repair as directed.
- .4 Re-test employing same criteria after repair.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 TOUCH-UP AND CLEANING

.1 Touch-up coating with top coats as required or where requested by the Consultant.

.2 Remove spilled, splashed, and spattered paint promptly as work proceeds and on completion of work. Clean surfaces soiled by paint spillage and paint spatters.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, products, equipment and services necessary for traffic signage work in accordance with the Contract Documents.

.2 Traffic signage within the Property shall be included in the Base Bid and is not part of cash allowances noted of in Division 1.

1.2 **REFERENCES**

.1 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

.2 AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels - Series: Components, Coatings and Finishes.

.3 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

.4 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.5 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

.6 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

1.3 **DESIGN REQUIREMENTS**

.1 Design traffic signage work in accordance with Contract Documents, utilizing material types, accessories and methods indicated and to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

.2 Design traffic signage to accommodate thermal movements of the components and structural movements to provide an installation free of oil canning, buckling, delaminating, excessive stress on fasteners or any other detrimental effects.

.3 Design miscellaneous, additional structural framing members as required to complete traffic signage work, where not indicated on Contract Drawings.

1.4 **SUBMITTALS**

.1 Product data:
  .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
    .1 Product transportation, storage, handling and installation requirements.

.2 Samples: Submit full scale sample of signage specified in accordance with Section 01 33 00 demonstrating font type, size, logo, material, colour and finish for the Consultant's approval.

.3 Shop drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 indicating:
.1 Elevations, sections, details, materials, thicknesses, sizes, finishes, colours, and mounting methods.
.2 Submit full size templates drawn-to-scale details for individually fabricated or incised lettering indicating word and letter spacing.

.4 Submit templates to Contractor for use by installers and fabricators as required for proper location and installation of hardware.

1.5 **DELIVERY, STORAGE AND HANDLING**

.1 Handle signs in accordance with AAMA CW-10.

.2 Deliver products to location at building site designated by Contractor.

2 Products

2.1 **MATERIALS**

.1 General:
.1 All materials under work of this Section, including but not limited to, adhesives, paints, sealants, coatings, solvents and grouts are to have low VOC content limits.
.2 Unless detailed or specified herein, standard products will be acceptable if construction details and installation meet intent of Drawings and Specifications.
.3 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.
.4 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharp defined profiles.
.5 Incorporate fastenings and anchorage required for building in of products.
.6 Provide fasteners and grout as required for complete and installation of the parking signs.

.2 Aluminum materials:
.1 Aluminum extrusions, plates, and reinforcements: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper.
.2 Aluminum sheet: AA6061 alloy, T6 temper, utility sheet, in accordance with ASTM B209M and ANSI H35.1, minimum 1.0 mm thick unless otherwise indicated.
.3 Finish and colour: 'Duranar (XL)' by PPG in accordance with AAMA 2605. Colours: To be selected by Consultant from manufacturer's full colour range.

.3 Isolation coating: Bitumastic coating, acid and alkali resistant material.

.4 Screws, bolts and other fasteners: Low profile, corrosion resistant stainless steel type 316 in accordance with ASTM F738M. Provide lock washers where vibration may occur.

.5 Non-shrink grout: Pre-mixed, flowable, non-shrink grout without aggregate fillers; MasterFlow 713 by BASF Building Systems or SikaGrout 212 by Sika Canada Inc.

2.2 **MISCELLANEOUS PARKING SIGNS**

.1 Provide post mounted prefinished metal barrier-free parking signs as shown on Contract Drawings within the property and as needed to City of Toronto By-laws for Parking Standards. Refer to Landscape Drawings for traffic signage posts as required for the Work.

.2 City of Toronto traffic signs outside of the property such as ‘ONE WAY’, ‘NO PARKING’ and similar, will be covered under the Division 1 cash allowance.

2.3 **FABRICATION**

.1 Fabricate traffic signage in accordance with reviewed shop drawings utilizing material types, accessories and methods described.

.2 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.

.3 Fabricate traffic signage free from defects impairing function, appearance, strength and durability.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install traffic signage in accordance with the reviewed shop drawings and manufacturer's written instructions in locations indicated.

.2 Install traffic signage securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist. All fastenings to be concealed or have colour matched heads.

.3 Completed sign work shall be free from distortion or defects detrimental to appearance or performance.

3.3 **CLEANING**

.1 During process of the work of this Section, the work premises shall be kept free of debris, and waste materials resulting from the work under this Section. Upon completion and before final acceptance of work, all debris, rubbish, leftover materials, tools, and equipment shall be removed from the Site.

.2 Final cleaning of all surfaces shall be carefully undertaken in accordance with sign manufacturer's instructions.

.3 Touch up any damaged finishes.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for washroom divider partition work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A167, Specification for Stainless Steel and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 **SUBMITTALS**

.1 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating fabrication and erection details, plans, elevations, hardware, and installation details.

.2 Samples:
.1 Submit samples in accordance with Section 01 33 00.
.1 Submit 300 x 300 mm samples for each colour.
.2 Submit samples of each hardware item, including brackets, fastenings, and trim.

.3 Closeout submittals: Provide maintenance data for maintenance of finished work for incorporation into Maintenance Manual in accordance with Section 01 78 23.

1.4 **PROTECTION**

.1 Cover finished surfaces with heavy Kraft paper or put in cartons during shipment. Protect installed surfaces by approved means. Do not remove until immediately prior to final inspection.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 Solid plastic toilet divider partitions, wall hung (DP);
.1 Solid Plastic Toilet Partitions by Hadrian, Inc.
.2 Or approved alternative.

2.2 **MATERIALS**

.1 All materials under work of this Section, including but not limited to, adhesives are to have low VOC content limits.

.2 Solid plastic toilet divider partitions (DP): Constructed from high density polyethylene (HDPE), class B conforming to ASTM E84. Colour of plastic material as selected by Consultant from manufacturer's full range of colours.

.3 Connecting brackets: channel shaped, stainless steel extrusion or casting, continuous.

.4 Stainless steel sheet metal: ASTM A167, Type 304 with No. 4 satin finish.

.5 Fasteners: Stainless steel tamperproof type screws and bolts.

2.3 **FABRICATION**

.1 Toilet divider partitions shall be used to separate children's toilets in wall hung applications as shown on Contract Drawings.

.2 Solid plastic toilet divider partitions:
- .1 Fabricate solid plastic partitions in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Fabricate work free from defects impairing function, appearance, strength and durability.

.3 Unless otherwise indicated, fabricate wall hung toilet divider partitions to be 25 mm thick in custom sizes as indicated on Contract Drawings.

.4 Divider partition fabrication shall be similar to urinal screen sizing rather than full height partitions. Refer to Contract Drawings for sizing and heights.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install washroom divider partitions in accordance with manufacturer's details and reviewed shop drawings, for a secure, plumb, square, and rigid installation.

.2 Provide toilet divider partitions consisting of panel and framing/supports.

.3 Anchor partition panels to walls with wall hung toilet divider partition brackets at height as indicated.

.4 Remove and replace damaged components not acceptable to Consultant.

3.3 **CLEANING**

.1 Clean partition surfaces in accordance with manufacturer's written instructions.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services for washroom accessories work as listed below in accordance with the Contract Documents.
- .1 Shower curtain, rod and curtain hooks.
- .2 Grab bars.
- .3 Mirrors.
- .4 Robe hooks.
- .5 Stainless steel shelf.
- .6 Diaper changing stations (future adult change table to be rough in only).
- .7 Folding shower seat.

.2 Owner supplied and Contractor installed washroom accessories: In accordance with Section 11 32 00.

1.2 **REFERENCES**

.1 ASTM A167, Specification for Stainless Steel and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM A312, Specification for Seamless and Welded Austenitic Stainless Steel Pipes.

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

.4 CAN/CSA B651-M, Barrier Free Design.

1.3 **SUBMITTALS**

.1 Product data: Submit Product data to requirements of Section 01 33 00 indicating each washroom accessory describing size, finish, details of function, attachment methods, hardware and locks, description of rough-in frame, and building-in details of anchors for grab bars.

.2 Closeout submittals:
- .1 Submit for each Product operation and maintenance instructions for incorporating into the Operations and Maintenance Manuals in accordance with Section 01 78 23.
  - .1 Supply 2 keys for each lockable washroom accessory to Consultant.
  - .2 Master key washroom accessories which are keyed.

1.4 **DELIVERY, STORAGE AND HANDLING**

.1 Deliver materials in sealed cartons and containers with manufacturer’s name and product description clearly marked.

1.5 **EXTENDED WARRANTY**

.1 Submit an extended warranty for washroom accessories work in accordance with the General Conditions, except that the warranty period is extended to 10 years.
- .1 Against cracked or scratched mirrors, spoiling or deterioration of silvering or backing, loosening of fastenings or adhesive
- .2 Coverage: complete replacement including effected adjacent work.

1.6 **MAINTENANCE**

1. Maintenance Tools: Provide special tools necessary for accessing, assembly/disassembly or removal of toilet, bath and cleaning accessories in accordance with Section 01 78 23.

2 Products

2.1 **MATERIALS**

.1 Stainless steel:
- .1 Sheet metal: ASTM A167, Type 304.
- .2 Tubing: ASTM A312, Type 304.

.2 Sheet steel: ASTM A653M, Z275; Cold rolled, commercial quality, surface preparation and pretreatment as required for applied finish.

.3 Fasteners, screws and bolts: ASTM A167, Type 304 stainless steel, tamper-proof.

2.2 **ACCESSORIES**

.1 Refer to drawings for quantity and location of washroom accessories.

.2 Owner supplied and Contractor installed items: In accordance with Section 11 32 00. Coordinate with noted Section as required for Owner supplied and Contractor installed washroom accessories, such as soap dispensers (SD), paper towel dispensers (PTD) and toilet paper dispensers (TPD).

3. Shower curtain and rod (SCR):
- .1 Shower rod and curtain hooks:
  - .1 #B6047 by Bobrick or #1204 by ASI Group Canada or approved alternative; 32 mm diameter, 1.0 mm thick tube, complete with 81 mm diameter flanges, #B204-1 by Bobrick or #1200-SHU by ASI Group Canada or approved alternative. Stainless steel curtain hooks. Length as indicated on drawings.
  - .2 Finish: Type 304 stainless steel satin finish.

.2 Shower curtain:
.1 #B204-2 by Bobrick or #1200-V by ASI Group Canada or approved alternative; 0.2 mm thick matte white vinyl, anti-bacterial treated, bottom and sides hemmed, complete with nickel plated brass grommets at 150 mm o.c.
.2 Size: 1065 mm wide x 1830 mm high.

.4 Straight grab bar (GB1 & GB5):
.1 Series B-6806-99 by Bobrick or #3800-P Series by ASI Group Canada or approved alternative; 38 mm diameter, 1.2 mm thick, concealed mounting with snap flange, complete with escutcheons. Configurations as indicated on drawings.
.2 Grab bar types, sizes and locations as follows:
.1 Grab bar (GB1): Horizontal grab bar, 610 mm long barrier-free washrooms as shown.
.2 Grab bar (GB5): Vertical grab bar, 900 mm long beside barrier-free bench in barrier-free shower.
.3 Finish: Type 304 stainless steel with a satin finish and peened grip.

.5 L-shaped grab bar, vertical (GB2):
.1 'Series 6898-99 - L30x30' by Bobrick Washroom Equipment or approved alternative; 38 mm diameter, 1.2 mm thick, concealed mounting with snap flange, complete with escutcheons.
.2 Length and configuration: 762 x 762 mm, in L-shaped configuration as shown on Contract Drawings, for use in barrier-free washrooms.
.3 Finish: Type 304 stainless steel with a satin finish and peened grip.

.6 L-shaped grab bar, vertical (GB3):
.1 'Model 1003-NP 36 × 36' by Frost Products Ltd. or approved alternative; 38 mm diameter, 1.2 mm thick, concealed mounting with snap flange, complete with escutcheons.
.2 Length and configuration: 900 x 900 mm, in L-shaped configuration as shown on Contract Drawings, for use in barrier-free shower.
.3 Finish: Type 304 stainless steel with a brushed finish and peened grip.

.7 Swing up/fold down grab bar (GB4):
.1 #3513 Swing-Up Grab Bar by ASI Group Canada or approved alternative; 38 mm diameter, 1.2 mm thick, 762 mm long in location as indicated. Installation to include anchor plate or sufficient blocking in intended wall assembly as required.
.2 Finish: Type 304 stainless steel with a satin finish and peened grip.

.8 Shatterproof mirrors (MR1 and MR2): 6 mm thick, shatterproof framed mirrors.
- .1 #20650 series by ASI Group Canada or approved alternative; unit to be complete with shatter-resistant acrylic plastic Plexiglass mirror.
- .2 Dimensions:
  - .1 Shatterproof mirror (MR1): 457 x 914 mm.
  - .2 Shatterproof mirror (MR2): 1750 x 950 mm.
- .3 Locations: For use at children's washrooms and additional areas as indicated by both mirror types.
- .4 Frame finish: Type 304 stainless steel satin finish.

.9 Large and custom sized acrylic mirrors (MR3): In accordance with Section 08 80 00.

.10 Silvered mirror glass (MR4): 6 mm thick, mirror quality float glass.
- .1 #B-290 Series by Bobrick or #20650 Series by ASI Group Canada or approved alternative; mitred corners welded, and polished smooth.
- .2 Dimensions: 457 x 914 mm.
- .3 Locations: For use at staff washrooms and additional areas as indicated.
- .4 Frame finish: Type 304 stainless steel satin finish.

.11 Safety robe hooks (CHK, safety):
- .1 Epoxy coated stainless steel collapsible robe, robe hook disengages with loads in excess of 25 lbs.
- .2 Safety coat hook,'1150-CLRS – Colored Safety Coat Hook' by Frost Products Ltd. or approved alternative.
- .3 Colour: Coat hook colour to be selected by the Consultant from manufacturer's full colour range.

.12 Robe hook (RH, non-safety, staff areas):
- .1 #B-233 by Bobrick or approved alternative; single robe hook, hook with flange, support arm and concealed mounting bracket.
- .2 Finish: Type 304 stainless steel, satin finish.

.13 Stainless steel shelf (STS):
- .1 #0692 Series by ASI Group Canada or approved alternative; shelf fabricated from 1.2 mm thick stainless steel with 13 mm return edge and front edge hemmed for safety.
- .2 Shelf complete with brackets fabricated from 1.2 mm thick stainless steel.
- .3 Size: 100 mm wide x 600 mm length.
- .4 Finish: Type 304 stainless steel, satin finish.

.14 Diaper changing stations for babies and children (DCS):
- .1 Changing centres (daycare centre): 'Changing Table with Sink and Stairs - Model 8543A', manufactured by Totmate or approved alternative, complete with roll out stairs, lockable storage cabinet base and one-piece molded top with 175 mm deep sink and faucet.
- .2 Changing station shall have Maple plastic laminate finish.
- .3 Coordinate with Division 22 as required for plumbing connections at sink.

.15 Adult changing stations (ACS - future adult change table - rough in only):
- .1 Provide power and blocking within intended wall assembly where future adult change table is to be installed.
- .2 Future adult changing table:
  - .1 Wall-mounted folding table with water containment system to direct fluids to drain, capable of withstanding 200 kg (440 lbs), complete with reversible padded comfort support.
  - .2 Table shall be fabricated from heavy duty aluminium frame with removable polyurethane foam mattress and be mounted on powder-lacquered stainless steel brackets.
  - .3 Table height to be adjustable, with range from 300 mm to 1000 mm above floor finish.
  - .4 Model: Pressalit Care 3000 by Max-Ability or approved alternative.

.16 Folding shower seat (FSS):
- .1 #B-5191 by Bobrick or #8203 Series by ASI Group Canada or approved alternative; surface wall mounted seat with 8 mm thick water-resistant, white coloured solid phenolic.
- .2 Dimensions: 405 mm deep x 460 mm wide.
- .3 Finish: Type 304 stainless steel frame.

3 Execution

3.1 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSTALLATION

.1 Verify and coordinate templates, inserts, and rough-in frames and verify exact location of washroom accessories for installation.

.2 Verify there is adequate supports and/or blocking in gypsum wall assemblies prior to installation of washroom accessories, such as but not limited to grab bars and change tables.

.3 Verify adequate blocking and required power has been installed in gypsum wall assembly for future adult change table.

.4 Provide fastening and mounting kits for washroom accessories.

.5 Locate washroom accessories where indicated on Drawings and where directed by Consultant.

.6 Install washroom accessory fixtures, accessories, and items in accordance with manufacturer's instructions and CAN/CSA B651-M. Provide exposed tamper-proof screws of stainless steel to match units.

.7 Install washroom accessories plumb, level, and securely and rigidly anchored to substrate surfaces and framing. Adjust accessories for proper operation and verify mechanisms function smoothly.

.8 Install grab bars to withstand minimum load of 1.3 kN applied vertically or horizontally. Provide necessary reinforcements as required.

3.3 **CLEANING**

.1 Clean and polish exposed surfaces and fill accessories with necessary supplies prior to acceptance by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for locker work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 CAN/CGSB-44.40, Steel Clothing Locker.

1.3 **SUBMITTALS**

.1 Product data:
  .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
    .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
    .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating type and class of lockers, elevations, sections, dimensions, gauges, tops, bases, hooks, shelves, trim, numbering, doors, handles, anchorage and hardware, and finishes.

.3 Samples:
  .1 Submit following samples in accordance with Section 01 33 00.
    .1 Two 50 x 50 mm samples of colour and finish on actual base metal.

.4 Closeout submittals: Submit maintenance and cleaning instruction for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

2 Products

2.1 **MANUFACTURED UNITS**

.1 Lockers (L1):
  .1 CAN/CGSB-44.40, triple tier, 305 mm wide x 457 mm deep x 1829 mm high; ‘Deluxe Lockers’ by Shanahan’s Manufacturing Limited or ‘Emperor’ by Hadrian Manufacturing Inc. or approved alternative by ASI Storage Solutions/Watrous or approved alternative manufacturer.
  .2 Staff locker configuration to be 3 high x 8 lengthwise for a total of 24 lockers.

.2 Locker construction:
  .1 Body: Minimum 0.61 mm thick steel sheet with flanged backs and rib stiffeners on sides.
  .2 Frames: Minimum 1.6 mm thick steel sheet, box channel shape, with 2 rubber door silencers on lock side of frame at approximately 38 mm from top and bottom of each door.

.3 Assembly: Knock down construction, pop-rivetted, exposed fasteners on fronts of locker doors and frames are not allowed.
.4 Top: Flat.
.5 Bottom base: Metal base constructed of same material as body, 100 mm high.
.6 Doors: Flush type construction, one-piece double-wall envelope construction, minimum 0.91 mm steel thickness, door are to be hinged on the right and swing from left to right.
.7 Door pulls: Nickel-plated steel, single point, recessed lock pocket with friction latch padlock locking system, padlock by Owner.
.8 Hinges: 2- 1.2 mm hinges welded to frame and fastened to door.
.9 Options: To CAN/CGSB-44.40, minimum 0.76 mm thick steel sheet, manufacturer's standard, trim, closures and 1 single prong nickel plated coat hook.
.10 Numbering: Each door to have number plate with non-removable numerals, one number designation for each locker.
.11 Ventilation: lockers shall have provision for ventilation through face and back.
.12 Finish: High performance baked on epoxy powder coating. Colour: to later selection of Consultant.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Assemble and Install lockers in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Securely fasten lockers to bases and grounds and nailing strips and to each other when in locker banks.

.3 Install trim and closures where indicated and where obstructions occur.

.4 Install locker numbers.

.5 Upon completion, test doors and adjust for ease of operation.

3.3 **CLEANING**

.1 Touch up scratches and abrasions to match original finish. Clean and polish lockers prior to final acceptance by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for miscellaneous specialties work as listed below in accordance with the Contract Documents.
- .1 Floor mat.
- .2 Janitor's shelf.
- .3 Corner guards.
- .4 Tackboards.
- .5 Fire safety plan lock box.
- .6 Bollard/column with card reader door and push paddle activation.

1.2 **SUBMITTALS**

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data for each Product specified in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating elevations, sections, details, dimensions, materials, gauges, and finishes.

.3 Closeout submittals: Submit cleaning and maintenance instructions for miscellaneous specialties for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.3 **DELIVERY, STORAGE, AND HANDLING**

.1 Package or crate, and brace products to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.

2 Products

2.1 **MANUFACTURED UNITS**

.1 Recessed floor mat (RFM):
- .1 Frame and Grid: Level base frame with drain pan, minimum 46 mm deep by area shown on drawings, Recessed type, extruded 6105-T5 aluminum alloy tread rails joined mechanically by extruded 6061-T6 aluminum alloy key lock bars. Tread rails to incorporate vinyl cushion. Furnish anchors for attachment to, or for casting in, concrete.
- .2 Finish: Clear anodized.
- .3 Tread insert: Black rubber insert.
- .4 Acceptable Manufacturer: 'Pedigrid G1' by C/S Group or approved alternative by McGill Architectural Products or approved alternative manufacturer.

.2 Janitor's shelf with mop and broom holders and hooks:
- .1 #B-239 x 34 by Bobrick Washroom Equipment of Canada or approved alternative.
- .2 330 mm H by 205 mm deep. Shelf constructed of minimum 1.2 mm stainless steel, mop and broom holders to have spring loaded rubber cam to grip handles up to 30 mm in diameter, and stainless steel hooks positioned below shelf.
- .3 Finish: Type 304 stainless steel with satin finish.

.3 Corner guards (CG):
- .1 Surface mounted, aluminum corner guards fabricated from Type 5005 H34 aluminum alloy with clear anodized finish and standard 90 degree angle, complete with countersunk screw fasteners and all accessories as required for a complete installation; 'Model CO-8' by C/S Group or approved alternative.
- .2 Corner guards shall have a minimum leg length of 50 mm and minimum nose radius of 4.8 mm. Height of 2600 mm.
- .3 Quantity: Provide fifty (50) corner guards to be incorporated into partitions throughout three floors of the building.

.4 Tackboards (TB):
- .1 6 mm thick high density burlap backed coloured cork laminated under heat and pressure to 6 mm MDF hardboard in colours as selected by Consultant.
- .2 Sizes: As indicated on Contract Drawings.
- .3 Tackboards to be complete with extruded aluminum trim with clear anodized finish, 'Elite Reveal Trim' by Architectural School Products or approved alternative.
- .4 Tackboards, 'Forbo Tackboards' by Forbo or approved alternative.

.5 Fire safety plan lock box (FSB):
- .1 Lock box and locking system requirements shall meet requirements of the Toronto Fire Service and Ontario Fire Code.
- .2 Vandal and weather resistant, 12 gauge steel fire safety plan box with heavy duty padlock, in white colour, including reflective graphics, fasteners and wall anchors.
- .3 Fire safety plan box, 'Model AA65VR' by Safety Media Inc. or approved alternative.

.6 Bollard/column with card reader door and push paddle activation:
- .1 Bollard/column: Stainless steel square bollard/column with card reader and push paddle activation and welded angle top, custom sized at 150 mm square x 1200 mm tall.
- .2 Card readers to be provided by Division 26 to suit Owner's requirements. Coordinate with noted Division as required for this work.
- .3 Acceptable manufacturers: Customized stainless steel bollard with card reader and push paddle activation, 'Bollard RT3' by Wikk Industries, Inc. or approved alternative.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

.1 Verify substrate surfaces are solid, free from surface water, dust, oil, grease, projections and other foreign matter detrimental to performance.

.2 Items to be built-in: Provide information and templates required for installation of work of this Section, and assist or supervise, or both, the setting of anchorage devices, and construction of other work incorporated with products specified in this Section in order that they function as intended.

.3 Verify there is adequate supports and/or blocking in gypsum wall assemblies prior to installation of miscellaneous specialty items as required.

3.3 **INSTALLATION**

.1 Install miscellaneous specialties level and securely and rigidly anchored to substrate in accordance with authorities having jurisdiction, reviewed shop drawings, and manufacturer's written instructions.

.2 After installation, adjust miscellaneous specialties in accordance with manufacturer’s written instructions.

3.4 **CLEANING**

.1 Clean and polish exposed surfaces prior to acceptance by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for fall protection systems work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ANSI, H35.1M Alloy and Temper Designation Systems for Aluminum (Metric).

.2 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

.3 ASTM A276, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.

.4 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.

.5 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

.6 CAN/CSA S16.1-M, Limit States Design of Steel Structures.

.7 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.8 CSA S157-M, Strength Design in Aluminum.

.9 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.10 CSA W47.2-M, Certification of Companies for Fusion Welding of Aluminum.

.11 CSA W48.1-M, Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.

.12 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.13 CAN/CSA W117.2-M, Safety in Welding, Cutting and Allied Processes.

.14 CAN/CSA-Z91, Health and Safety Code for Suspended Equipment Operations.

.14 CAN/CSA-Z271, Safety Code for Suspended Platforms

1.3 **DESIGN REQUIREMENTS**

.1 Design fall protection and window cleaning systems in accordance with the Occupational Health & Safety Act and Regulations; Ont. Reg. 859/90, CAN/CSA-Z91, and CAN/CSA-Z271. Comply with the “Guidelines for Multi-Point Suspended Scaffolds (MPSS)” issued by the Ontario Ministry of Labour.

.2 Design fall protection system in accordance with Occupational Health & Safety Act, CAN/CSA-Z91, CAN/CSA-Z271, and to withstand live, dead, seismic, imposed and other loads, and which meets proper and current window washing practices.

.3 Design structural members with 4:1 safety factor based on ultimate strength and normal operating conditions or with limit states design as specified in referenced standards.

.4 Design fall protection system to ensure building surfaces and finishes will not be marred or otherwise damaged during normal operation of equipment.

.5 Design all anchor components to provide an adequate attachment means suited to current window washing practices and compatible with industry standard equipment.

.6 As a minimum, design shall comply with CSA S16.1, CSA S136, and CAN3 S157-M.

.7 Design horizontal cable life line system to incorporate the following:
- .1 Design system to comply with the following fall protection system (FAS) requirements.
- .2 Design system to a typical minimum load of 2,200 lb when used with a body harness and be rigged such that a user can neither free fall more than 1.8 m nor contact any lower level.
- .3 System must include all hardware, two sayflink lanyards attached to the horizontal life line system complete with body harness.
- .4 Design system with a factor of safety of 2 without any permanent deformation or detachment.
- .5 Workers shall use a shock absorbing lanyard rated for 900 lbs maximum arrest force.

.8 Design fall arrest anchor system to accommodate the following work loads:
- .1 To a typical maximum fall arresting force of 1,800 lb when wearing a body harness, with a factor of safety of 2 without any permanent deformation and to 5000 lbs against fracture or detachment.

1.4 SUBMITTALS

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations, and trouble-shooting protocol.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
  - .1 Elevations, sections, details, materials, operating components, dimensions, gauges, finishes and relationship to adjacent construction.
  - .2 Complete layout and configuration of complete fall protection system, including locations and all other components and accessories.

.3 Clearly indicate design and fabrication details, window drops, hardware and installation details.
.4 Include all necessary Restrictive and Non Restrictive Working Usage Notes and General Safety Notes.
.5 Complete engineering design data confirming that Products meet design criteria specified.
.6 Name and proof of CWB Certification or welding fabricator.

.3 Reports/certificates/letters:
.1 Provide all necessary and required test reports and certificates to comply with the relevant codes and regulations of jurisdictional authorities.
.2 Submit test data from an independent testing laboratory to show that all anchors which are to be used in this project meet the loading requirements of CAN/CSA-Z91-M. Anchors are to be tested after installation to loads specified in design standard in Design Requirements.
.3 Submit inspection reports within 5 days of inspection.
.4 Submit certified proof of product liability insurance.
.5 Submit a letter from the Engineer certifying that fall protection system meets the performance requirements of the Ministry of Labour and standards specified in Design Requirements.

.4 Closeout submittals:
.1 Provide at each roof entrance a reduced plastic laminated as-built shop drawing showing anchor locations and details, in accordance with requirements of jurisdictional authorities. Drawings shall be metal framed with clear polycarbonate scratch resistant cover and securely screwed to wall.
.2 Complete inspection log book, to certify fall protection system is ready for use in accordance with requirements of jurisdictional authority and for yearly inspections.
.3 Submit following for each Product incorporation into Operations and Maintenance Manuals in accordance with the Conditions of the Contract:
.1 Identification: Manufacturing name, type, year, serial number, number of units, capacity, and identification of related systems.
.2 Functional description detailing operation and control of components.
.3 Performance criteria and maintenance data.
.4 Operating instructions and precautions.
.5 Safety precautions.

1.5 QUALITY ASSURANCE

.1 Manufacturer's qualifications:
.1 Execute work of this Section only by a Subcontractor specializing in the design, fabrication and installation of fall protection systems and who is also known to have been responsible for satisfactory installations similar to that specified during a period of at least the immediate past five years.
.2 Manufacturers shall carry specific liability insurance (products and completed operations insurance in the amount of $ 5,000,000.00). This insurance must cover the failure of equipment and anchors.

.2 Installers qualifications: Perform work of this Section by a company that is employed by, and under direct supervision of component manufacturer and has a minimum of five years proven experience in the installation of fall protection systems of a similar size and nature.

.3 Retain a Professional Engineer, licensed in Province of Ontario, with experience in fall protection systems work of comparable complexity and scope, to perform following services as part of work of this Section:
.1 Design of fall protection system.
.2 Review, stamp, and sign fabrication, shop drawings, and design calculations.
.3 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of work is in accordance with Contract Documents and reviewed shop drawings.

.4 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1 and CSA W47.2-M. Ensure welding operators are licensed per CSA W47.1 and CSA W47.2-M for types of welding required by work.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 This specification is written on the basis of products by Pro-Bel Enterprises Limited. Specified manufacturer's products establish the minimum acceptable standards for the work of this Section.

.2 Alternative equipment and products by Ankor Engineering Systems Inc. or Thaler Industries Ltd. will be considered provided they meet or exceed specified manufacturer's standard. Conform to the requirements for equivalent products specified in Division 1.

2.2 **MATERIALS**

.1 Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W.

.2 Aluminum: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper.

.3 Stainless steel: ASTM A276, Type 304.

.4 Welding materials: CSA W48.1-M and CSA W59-M.

.5 Horizontal lifeline system - non-hands free (double lanyard) system - J-Clamp: ‘Model HLL-DL3-PB’ by Pro-Bel Enterprises Limited or approved alternative, including the following components:
.1 Turnbuckle: Part # P-HG228-12.
.2 Intermediate anchor/cable support: Pro-bel model.
.3 Corner anchor/cable support: Pro-bel model.
.4 End anchor/cable support: Pro-bel model.
.5 J-clamp package: Part # P-HLL-JCLAMP05.

.6 Wire rope thimble: Part # P-G411.
.7 Shock absorber: Part # FA-PB-IN-SH.
.8 Galvanized aircraft cable: Part # P-BMC-05G.
.9 Auxiliary bypass lanyard with shock absorber.

.6 Bolt to structure wall anchor: Stainless steel 'u' bar welded to galvanized steel plate with galvanized steel or stainless steel bolts and matching nuts, and lock washers, 'Model PB46SG' by Pro-Bel Enterprises Limited or approved alternative.

2.3 **FABRICATION**

.1 Verify dimensions of existing work before commencing fabrications and report discrepancies to Consultant.

.2 Fabricate work in accordance with reviewed shop drawings.

.3 Fabricate work free from defects impairing function, strength and durability.

.4 Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes. Cap open ends of sections exposed to view.

.5 Fabricate work with materials and component sizes, metal gauges, reinforcing, anchors, and fastenings of adequate strength to ensure that it will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended and specified use and with allowable design factors imposed by jurisdictional authorities.

.6 Weld all connections, unless otherwise indicated. Cleanly and smoothly finish exposed edges of materials including holes.

.7 Steel pipe uprights:
.1 Fill steel pipe uprights with urethane foam insulation or other accepted filler.
.2 Size uprights for a minimum 200 mm exposure above roof membrane in accordance with good roofing practices.

2.4 **WELDING**

.1 Perform welding by electric arc process.

.2 Execute welding to avoid damage or distortion to work. Execute welding in accordance with following standards:
.1 CSA W48.1-M - for Electrodes. If rods are used, only coated rods are allowed.
.2 CSA W59-M and CSA W59S1-M for design of connections and workmanship.
.3 CAN/CSA W117.2-M - for safety.

.3 Thoroughly clean welded joints and expose steel for a sufficient distance to perform welding operations. Finish welds smooth. Supply continuous and ground welds which will be exposed to view and finish painted.

.4 Test welds for conformance and remove work not meeting specified standards and replace to Consultant's acceptance.

2.5 **HOT DIP GALVANIZING**

.1 After fabrication, hot dip galvanize steel items that will be exposed to the elements and as indicated. After galvanizing, plug relief vents air tight with appropriate aluminum plugs as suitable and required for intended metal fabricated item. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with zinc rich primer in accordance with manufacturer's printed directions.

.2 Hot-dip galvanize members in accordance with requirements of the following ASTM, with minimum coating weights or thicknesses as follows:

.1 Rolled, pressed and forged steel shapes, plates, bars and strips: ASTM A123; average weight of zinc coating per square/metre of actual surface, for 4.8 mm and less thickness members 600 g/m^2 for 6 mm and heavier members 640 g/m^2.

.2 Iron and steel hardware: ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface, in accordance with ASTM A153,Table 1 for the various classes of materials used in the Work.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Take site measurements of construction to which work of this Section must conform, and through which access must be made, before work is delivered to site, to ensure that adaptation is not required which would result in construction delay.

3.2 **INSTALLATION**

.1 Install work in accordance with reviewed shop drawings and manufacturer's recommended specifications, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.

.2 Provide anchorage information, roughing-in dimensions, templates, and service requirements 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 work specified in this Section in order that they function as intended.

.3 Assemble components delivered in sections. Use only fastenings suitable for materials.

.4 Work shall include rough hardware, fastenings, and other items necessary for secure installation.

.5 Install work straight, plumb, level, and secured to prevent distortion or displacement, or both.

.6 Secure components to building structure or construction as required to maintain it permanently in place, and so that it functions properly with no damaging vibration to the building or itself.

.7 Insulate between dissimilar metals, to prevent electrolysis.

3.3 **REPAIR**

.1 Refinish damaged or defective work so that no variation in surface appearance is discernible.

3.4 **ADJUSTING AND FINAL INSPECTION**

.1 Verify under work of this Section that installed products function properly, and adjust them accordingly to ensure satisfactory operation. Window cleaning roof anchors shall be inspected and tested by an independent inspection and testing body approved by jurisdictional authorities, before being used for the first time, independent and inspection and testing body shall fill out the log book in accordance with jurisdictional authority requirements.

.2 Complete the inspection log book to certify system for use.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for appliance and equipment Work in accordance with the Contract Documents.

1.2 **SUBMITTALS**

.1 Product data:
  .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
    .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations and warranties.
    .2 Product transportation, storage, handling and installation requirements.

.2 Closeout submittals: Submit recommended maintenance instructions and listing of recommended maintenance Products for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.3 **QUALITY ASSURANCE**

1. All electrical equipment shall have attached labels attesting to CSA or Electrical Safety Authority approval, and shall have magnetic starters for motors, transformers, and overload protection.

1.4 **DELIVERY, STORAGE AND HANDLING**

1. Package equipment to prevent damage or distortion during shipment and handling. Label packages and protect finish surfaces by sturdy wrappings, strippable plastic or equivalent protection.

2. Do not deliver equipment to site until conditions are such that no damage will occur to them while in storage. Store equipment on site in a manner to prevent damage.

1.5 **SCHEDULING**

1. Provide equipment or its parts ready for installation in accordance with construction schedule. Verify required delivery date sufficiently before delivery to ensure that construction is not delayed.

2 Products

2.1 **APPLIANCES AND EQUIPMENT**

1. General:
   - .1 Quantities and locations of appliances and equipment as shown on Contract Drawings and Equipment List appended to this Section.
   - .2 Equipment shall include all components required by jurisdictional authorities, and to protect the equipment from damage during operation.
   - .3 Equipment shall include all components, connections, devices and controls required to make it fully and safely operable.
   - .4 Provide reinforcing and anchorage for built-in products.
   - .5 Insulate between dissimilar metals, and metal and masonry, to prevent electrolysis.

2. Appliances and equipment:
   - .1 Refer to Equipment List appended to this Section for appliances and equipment to be supplied and installed by the Contractor for Work of this Project.
   - .2 Alternative Products will be considered provided they are approved by the Consultant.

2.2 **FABRICATION**

1. Fit joints and junctions between components tightly, in true planes, and to prevent entry of water to collect in component voids. Cap open ends of sections exposed to view.

2. Fabricate Work with materials and component sizes, metal gauges, reinforcing anchors, and fastenings of adequate strength to ensure that it will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended and specified use. Conceal and weld connections wherever possible.

3. Cleanly and smoothly finish exposed edges of materials including holes and cutouts.

4. Provide reinforcing and attached anchorage for built-in products.

5. Provide holes and connections for Work installed under other Sections.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

2. Before installation commences, ensure that mounting devices, members and surfaces are satisfactory for fitting, and adequate for securing of Work.

3. Take site measurements of construction to which Work of this Section must conform, and through which access must be made, before Work is delivered to site, to ensure that adaptation is not required which would result in construction delay.

3.2 **INSTALLATION**

1. Obtain and pay for all permits and connection fees as per authorities having jurisdiction.

2. Perform mechanical and electrical work in accordance with applicable codes and standards. Coordinate with applicable Sections as required for Work of this Section.

3. Obtain from manufacturer or supplier, anchorage information, roughing-in dimensions, templates and service requirements for installation of Work of this Section. Also obtain assistance from manufacturer or supplier, for the setting of anchorage devices, and construction of other Work incorporated with equipment specified in this Section in order that they function as intended.

4. Install Work to meet manufacturer's recommended specifications, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.

5. Work shall include rough hardware, fastenings and other items necessary for secure installation.

6. Use only fastenings suitable for materials. Do not use through fastening at floors or walls.

7. Install Work straight, plumb, level, and secured to prevent distortion or displacement, or both. Shim as necessary with concealed shims. Where required, use grout on which iron oxide deposits will not form.

8. Secure fixed equipment to building structure or construction as required to maintain it permanently in place, and so that it functions properly with no damaging vibration to the building or itself.

9. Install equipment with connections provided and as required for plumbing and electrical services.

10. Mechanical work:
    .1 Obtain and pay for all permits and connection fees as per authorities having jurisdiction.
    .2 Provision of mechanical services and connection of equipment to mechanical Work is specified in Division 22.

11. Electrical:
    .1 Obtain electrical permit and connection fees as required by authorities having jurisdiction.
    .2 Provision of electrical service and connections of equipment to the services is specified in Division 26.

3.3 **REPAIR**

1. Refinish damaged or defective Work so that no variation in surface appearance is discernible. Refinish Work at site only if approved by Consultant.

3.4 **ADJUSTING**

1. Verify under work of this Section that installed products function properly, and adjust them accordingly to ensure satisfactory operation.

2. Lubricate equipment as specified by equipment manufacturer.

3.5 **CLEANING**

1. Clean and polish all surfaces that are exposed to view from any location on completion of installation.

2. Remove packaging materials and debris from installation from the site.

3.6 **DEMONSTRATION**

1. After start-up, adjusting and cleaning, demonstrate operation of equipment to Owner and Consultant, prior to Substantial Performance of the Work. Demonstrations shall be made:
   .1 When the Work is certified complete by the Consultant.
   .2 When the Work is turned over to the Owner.

2. Knowledgeable representatives of the manufacturers and installers of the equipment being demonstrated shall be present at time of demonstrations.

END OF SECTION

1 **EQUIPMENT LIST**

.1 **DW-1:**
Dishwasher Tall with 17” metal stand
Provide locks for undercounter cabinets under sink beside dishwasher that house the chemicals

Acceptable Product: LXeR Advansys model
https://cdn2.webdamdb.com/md_dezp5gnPHlWS.jpg.pdf?v=1

.2 **D:**
Compact Dryer
842 x 598 x 599mm

Acceptable Product: Bosch Ascenta 24" 500 series WTG86401UC
https://www.bosch-home.ca/en/productlist/washers-and-dryers/compact-dryers/condenser-tumble-dryers/WTG86401UC?breadcrumb=tumbledryers

.3 **FRE-1:**
Full Freezer with Double Louvered Trim Kit for All-Freezer side-by-side installation
66"W x 25-1/4"D x 72"H

Acceptable Products:

Frigidaire Double Unit with Trim Kit, FGFU19F6QF
Trim Kit, TRIMKITEZ2
http://manuals.frigidaire.com/prodinfo_pdf/Specsheets/FGFU19F6Q_0715_EN.pdf

.4 **MW-1:**
Microwave (Infant, Toddler, Preschool)
374.6 x 279.4 x 48.26mm

Acceptable Product:
Whirlpool® 0.9 Cu. Ft. Countertop Microwave, WMC11009AS
https://www.whirlpool.ca/en_ca/kitchen/cooking/microwaves/countertop/p.whirlpool-0.9-cu.-ft.-countertop-microwave.wmc11009as.html

.5 **MW-2:**
Microwave (Staff Room, Kitchen, Servery)
438.2 x 330.2 x 552.4mm

Acceptable Product:
Whirlpool 1.6 cu. ft. Countertop Microwave with 1,200 Watts Cooking Power, YWMC30516HZ
https://www.whirlpool.ca/en_ca/kitchen/cooking/microwaves/countertop/p.1.6-cu.-ft.-countertop-microwave-with-1,200-watt-cooking-power.ywmc30516hz.html

.6 **REF-1:**
Full Refrigerator (Kitchen)
32" W x 26-1/2" D x 71-3/8" H

Acceptable Product:
Frigidaire Gallery 19 Cu. Ft. All Refrigerator, FGRU19F6QF
http://manuals.frigidaire.com/prodinfo_pdf/Specsheets/FGRU19F6Q_0715_CN.pdf

.7 **FRE-2:**
Apartment-Size Refrigerator (Infant and Staff Room)
24"W x 29"D x 59-7/8"H

Acceptable Product:
Frigidaire 12 Cu. Ft. Top Freezer Apartment-Size Refrigerator, FFET1222QS
http://manuals.frigidaire.com/prodinfo_pdf/Specsheets/FFET1222Q_0415_CN.pdf

.8 **FRE-3:**
Compact Refrigerator

Acceptable Product:
Danby 3.3 cu. ft. Compact Refrigerator
DAR033A6BSLDB
https://www.danby.com/products/compact-refrigerators/dar033a6bsldb/?o=pdf

.9 **RH-1:**
Range Hood

Acceptable Product:
Broan Sahale, BKSH1 Series, Stainless or Black
http://www.broan.ca/common/productDigitalAssethandler.ashx?id=b0ec1a0e-1911-4bb0-a44a-cd4ad711eb97

.10 **STV-1:**
Electric Range
Stainless Steel
29-7/8" W x 28-1/2" D x 47-3/4" H

Acceptable Product:
Frigidaire 30" Freestanding Electric Range CFEF3055TS
http://manuals.frigidaire.com/prodinfo_pdf/Specsheets/CFEF3055TD_0617_CN.pdf

.11 **WA-1:**
Drop-in Warmer
Allow for adequate counter space and electrical

Acceptable Product:
Vollrath Cayenne Model 2001 Drop-In Warmer
http://vollrath.com/resources/14007/SPC_WarmerModel2001Drop-in_L35549_en_2017-11-29.pdf?resourceType=Resource

.12 **W/D:**

Washer/Dryer Combo with Stack Kit

Acceptable Products:

Compact Washer: Bosch 500 series WAT28401UC
Stackable
848 x 598 x 590mm
https://www.bosch-home.ca/en/productlist/washers-and-dryers/compact-washers/compact-washers/WAT28401UC?breadcrumb=null

Compact Dryer: Bosch Ascenta 500 series WTG86401UC
Stackable
842 x 598 x 599mm
https://www.bosch-home.ca/en/productlist/washers-and-dryers/compact-dryers/condenser-tumble-dryers/WTG86401UC?breadcrumb=tumbledryers

Stack Kit for Washer/Dryer: Bosch Stacking Kit WTZ20410
https://www.bosch-home.ca/en/productlist/washers-and-dryers/accessories/WTZ20410#/Tabs=section-technicalspecs/Tabs=tab-4357071/

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for supplied and installed equipment work in accordance with the Contract Documents.

1.2 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations and warranties.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Certificates: Submit manufacturer's certificates stating that products are in accordance with this specification.

.3 Closeout submittals: Submit recommended maintenance instructions and listing of recommended maintenance Products for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23.

1.3 **QUALITY ASSURANCE**

1. Regulatory Requirements: All electrical equipment shall have attached labels attesting to CSA or Electrical Safety Authority approval, and shall have magnetic starters for motors, transformers, and overload protection.

1.4 **DELIVERY, STORAGE AND HANDLING**

1. Package or crate, and brace products to prevent damage or distortion of equipment in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings or equivalent protection. Provide temporary skids under large or heavy units.

2. Do not deliver products to site until conditions are such that no damage will occur to them while in storage.

3. Store equipment at site in a manner to prevent damage to equipment.

4. Uncrate equipment only before installation.

1.5 **SCHEDULING**

1. Provide equipment or its parts ready for installation in accordance with construction schedule. Verify required delivery date sufficiently before delivery to ensure that construction is not delayed.

2 Products

2.1 **EQUIPMENT**

1. Provide reinforcing and anchorage for built-in products.

2. Insulate between dissimilar metals, and metal and masonry, to prevent electrolysis.

3. Equipment shall include all electrical components required by jurisdictional authorities, and to protect the equipment from damage during operation.

4. Equipment shall include all components, connections, devices and controls required to make it fully and safely operable.

2.2 **FABRICATION**

1. Fit joints and junctions between components tightly, in true planes, and to prevent entry of water to collect in component voids. Cap open ends of sections exposed to view.

2. Fabricate Work with materials and component sizes, metal gauges, reinforcing anchors, and fastenings of adequate strength to ensure that it will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended and specified use. Conceal and weld connections wherever possible.

3. Cleanly and smoothly finish exposed edges of materials including holes and cutouts.

4. Provide reinforcing and attached anchorage for built-in products.

5. Provide holes and connections for Work installed under other Sections.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

2. Before installation commences, ensure that mounting devices, members and surfaces are satisfactory for fitting, and adequate for securing of Work.

3. Take site measurements of construction to which Work of this Section must conform, and through which access must be made, before Work is delivered to site, to ensure that adaptation is not required which would result in construction delay.

3.2 INSTALLATION

1. Obtain from manufacturer or supplier, anchorage information, roughing-in dimensions, templates and service requirements for installation of Work of this Section. Also obtain assistance from manufacturer or supplier, for the setting of anchorage devices, and construction of other Work incorporated with equipment specified in this Section in order that they function as intended.

2. Install Work to meet manufacturer's recommended specifications, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.

3. Work shall include rough hardware, fastenings and other items necessary for secure installation.

4. Use only fastenings suitable for materials. Do not use through fastening at floors or walls.

5. Install work straight, plumb, level, and secured to prevent distortion or displacement, or both. Shim as necessary with concealed shims. Where required, use grout on which iron oxide deposits will not form.

6. Secure fixed equipment to building structure or construction as required to maintain it permanently in place, and so that it functions properly with no damaging vibration to the building or itself.

7. Install equipment with connections provided as required for plumbing and electrical services.

8. Mechanical:
   - .1 Provision of mechanical services and connection of equipment to mechanical Work is specified in Division 22.
   - .2 Obtain and pay for all permits, heat calculations, and connection fees as per authorities having jurisdiction.

9. Electrical:
   - .1 Provision of electrical service and connections of equipment to the services is specified in Division 26.
   - .2 Obtain electrical permit and connection fees as required by authorities having jurisdiction.

3.3 REPAIR

1. Refinish damaged or defective Work so that no variation in surface appearance is discernible. Refinish Work at site only if approved by Consultant.

3.4 ADJUSTING

1. Verify under Work of this Section that installed products function properly, and adjust them accordingly to ensure satisfactory operation.

2. Lubricate equipment as specified by equipment manufacturer.

3.5 CLEANING

1. Clean and polish all surfaces that are exposed to view from any location on completion of installation.

2. Remove packaging materials and debris from installation from the site.

3.6 DEMONSTRATION

1. After start-up, adjusting and cleaning, demonstrate operation of equipment to Owner and Consultant, prior to Substantial Performance of the Work. Demonstrations shall be made:
   .1 When the Work is certified complete by the Consultant.
   .2 When the Work is turned over to the Owner.

2. Knowledgeable representatives of the manufacturers and installers of the equipment being demonstrated shall be present at time of demonstrations.

3.7 OWNER SUPPLIED/CONTRACTOR INSTALLED ITEMS

1. Owner supplied and Contractor installed items:
   .1 Soap dispensers (SD).
   .2 Paper towel dispensers (PTD).
   .3 Toilet paper dispensers (TPD).
   .4 Sanitary napkin disposals (SND).
   .5 Additional items as indicated by the Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment, tools, supervision, and services necessary for the manufacture, delivery, installation, testing, maintenance, and adjusting of gearless, machine room-less, traction elevators in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.2 ASME A17.1/CSA B44, Safety Code for Elevators and Escalators.

.3 BS EN 12016, Electromagnetic Compatibility. Product Family Standard for Lifts, Escalators and Moving Walks. Immunity.

.4 CSA B651, Accessible Design for the Built Environment.

.5 CSA C22.1, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.

.6 CSA C22.2 No.141-M, Unit Equipment for Emergency Lighting.

.7 Elevating Devices Act and Ontario Regulation 463/86.

.8 City of Toronto Accessibility Design Guidelines.

1.3 **DESIGN REQUIREMENTS**

.1 Design elevator with electric operating and control equipment in accordance with the Elevating Devices Act and Regulation in accordance with the requirements of ASME A17.1/CSA B44 safety code and latest supplement.

.2 Design elevator equipment to fit into space provided for hoistway, pit and areas shown on Contract Drawings.

.3 Provide smooth acceleration and deceleration of car without perceptible steps so adjusted as not to cause passenger discomfort.

.4 Elevator to travel between typical floors in not more than 10s. Measure time from instant doors start to close until car has stopped level with next floor.

.5 Design guide rail brackets for attachment to elevator pit and shaft walls as shown on Contract Drawings.

.6 Design car and counterweight safety to release when car or counterweight moves in "up" direction.

.7 Refer to ‘Barrier Free Design’ Article for additional requirements for elevator.

.8 Elevator Characteristics:
- .1 Rated net capacity: 1814 kg (4000 lbs).
- .2 Rated speed: 0.75 m/s (150 feet/minute).
- .3 Travel Distance (nominal): 8400 mm.
- .4 No. of Stops: 3.
- .5 No. of Openings: 3 in-line.
- .6 Elevator shaft size: Minimum 2946 x 2159 mm (wall to wall); tolerance of -0 mm and +50 mm.
- .7 Elevator platform size:
  - .1 Platform size of 2340 x 1899 mm.
  - .2 Elevator shall accommodate and provide adequate access for a patient stretcher 2010 mm long and 610 mm wide in the prone position.
- .8 Clear overhead: 4147 mm.
- .9 Cab height: 2438 mm.
- .10 Clear cab height under suspended car ceiling: 2293 mm.
- .11 Door type: double.
- .12 Door Operation: Single speed with centre opening.
- .13 Door width: 1219 mm.
- .14 Door height: 2134 mm.
- .15 Pit height: 1524 mm.
- .16 Mechanical power required: 7.7 kW (10.4 Hp).
- .17 Estimate weight with motor: 750 kg.
- .18 Estimate car weight: 1910 kg.
- .19 Estimated weight including 50% overall balance: 2817.
- .20 Rated motor output: 11.2kW(15.0 Hp) - 49 RPM.
- .21 Rated controller output: 11.0kW(15.0 Hp).
- .22 CWT governor type and safety: None.
- .23 Middle weight width: 275.
- .24 Interlocks: AMD.
- .25 Hoist ropes: (5) 10 mm.
- .26 Roping type: 2:1.
- .27 Car governor rope: 6.0 mm.
- .28 Compensation: None.
- .29 CWT governor rope: None.
- .30 Car buffer type and stroke: Polyurethane, 64 mm stroke.
- .31 CWT buffer type and stroke: Polyurethane, 64 mm stroke.
- .32 Car guide rails: 18 kg/m in specified product.
- .33 CWT guide rails: 12 kg/m in specified product.
- .34 Pit ladder and hoist beams: Provided by elevator manufacturer and installed by work of Section 05 50 00.

.9 Car operation:
- .1 Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

.10 Include independent service on cars as follows:
- .1 By means of switch in service cabinet, allow removal of that car from group service and operate in response to car calls only.
- .2 Open doors automatically on arrival at floor.
- .3 Render hall signals inoperative when operating on independent service.

.11 Include battery lowering system as follows:
- .1 Equip elevator with emergency battery lowering feature to enable emergency travel of elevator car in the event of power failure.

.12 Furnish car lighting and ventilation operation with energy saving mode as follows:
- .1 Automatically extinguish regular interior lighting and stop car fan or blower.
- .2 Disable power circuits to convenience outlets and plug receptacles on top and bottom of car.
- .3 Resume normal function of lighting and fan when power is reinstated.
- .4 Arrange circuits so that power to lighting and fan or blower is not interrupted by overload, blown fuse or other abnormal condition.

.13 When car without registered car calls arrives at floor where both up and down calls are registered, initially respond to hall call in direction of travel. If no car or hall call is registered for future travel in that direction, close doors, immediately reopen them and respond to hall call in opposite direction.

.14 Operate lanterns to correspond with next direction of travel. When responding to hall call, operate lantern to correspond with direction of call being answered.

.15 Fire Fighter's Operation: In accordance with Authorities having Jurisdiction.

.16 Arrange emergency power to operate position indicators in cars.

.17 Power supply:
- .1 Equipment Power: Indicated on electrical drawings and as specified herein, maximum allowable voltage variation is +/- 10%, including following for required elevator:
  - .1 Nameplate amps: 42.
  - .2 Maximum acceleration amps: 54.
- .2 Protection device required prior to installation. Maximum motor branch short-circuit protection is:
  - .1 UL Class RK1 fuse (amp): 60.
  - .2 Trans rated voltage: 208V, 3 Phase, 60 Hz.
  - .3 Supplied voltage: 208 V.
- .3 Lighting: 120 V, 15 A, single phase, 60 Hz, alternating current.

1.4 SUBMITTALS

.1 Product data:

.1 Submit duplicate copies of manufacturer's Product data for each Product specified in accordance with Section 01 33 00 indicating:

.1 Performance criteria, compliance with appropriate reference standards, characteristics, limitations, and trouble-shooting protocol.

.2 Signal and operating fixtures, operating panels, indicators, car design and components, doors and frame details, door protective devices, microprocessor controller, and telephone.

.3 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:

.1 Submit shop drawings in accordance with Section 01 33 00. In addition to the requirements of ASME A17.1/CSA B44, shop drawings shall indicate:

.1 Elevations, sections and details of elevator and operating components, dimensions, gauges, finishes and relationship of operating components to adjacent construction.

.2 Size and location of machine and controller.

.3 Weights of principal components.

.4 Complete electrical wiring diagrams including electrical schematics and sequence of operation.

.5 Complete engineering design data to confirm that elevators meet design criteria specified.

.6 Electrical power information including voltage confirmation sheet, recommended fuse ratings, sizes and types, equipment starting and running current.

.7 Size and location of car, hoisting beam, Guides, buffers, buffer supports, and other components in hoistway.

.8 Details of work required by other trades.

.9 Rail bracket spacing and maximum loads on guide rails.

.10 Forces on guide rails, and at other points of support.

.11 Rating of drive motor.

.12 Top and bottom clearance and over travel of car.

.13 Location of disconnects, circuit breaker, light switches and feeder extension points.

.14 Heat dissipation rate for elevator equipment.

.15 Hoistway entrances and doors showing method of operation, details of construction, and method of fastening to structural members of structure.

.16 Signal and operating fixtures including hall lanterns, car riding lanterns, hall buttons, car position indicator, control switches.

.17 Wiring diagram showing connections from each source.

.18 Loads on hoist beams.

.19 Seismic design data.

.3 Samples:
.1 Eight weeks after Notification of Award, submit 2 samples of the following in accordance with the Conditions of the Contract.
.1 Elevator operating buttons, car interior, car ceiling, car door, hoistway entrance door and frame finishes.

.4 Reports:
.1 Prior to installation of elevators, submit to the Consultant 2 approved copies of submissions made to the Technical Standards and Safety Authority (TSSA).
.2 Provide inspection certificates upon elevator completion.

.5 Operations and Maintenance Manuals:
.1 Submit following for each Product for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 23:
.1 Identification: Manufacturing name, type, year, serial number, number of units, capacity, and identification of related systems.
.2 Functional description detailing operation and control of components.
.3 Performance criteria and maintenance data.
.4 Operating instructions and precautions.
.5 Safety precautions.
.6 Component parts availability including names and addresses of spare part suppliers.
.7 Consumables.
.8 Maintenance and troubleshooting guidelines/protocol, and recommended equipment for analysis and repair.
.9 Final tests and commissioning reports.
.10 Items to be submitted to Consultant: keys, tools, special devices, maintenance materials.
.11 Record drawings.
.12 Description of operation and control equipment.
.13 Equipment maintenance check chart.
.14 Equipment trouble shooting guide and instructions.
.15 Name, address, telephone and facsimile numbers for major component manufacturers.
.2 Manual documents that are larger than standard size sheets shall be neatly folded and housed in large envelopes or drawing pockets. These documents shall be inserted and housed in each manual binder.

1.5 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in Elevator Work of comparable complexity and scope, to perform following services as part of Work of this Section:
.1 Design of elevators.
.2 Review, stamp, and sign shop drawings and design calculations.

.2 Manufacturer's qualifications: Perform work of this Section by a company that has a minimum of fifteen (15) years proven experience in the manufacture of elevator systems of a similar size and nature. The manufacturer shall have a documented quality assurance program.

.3 Installer's qualifications: The equipment manufacturer shall install the elevator.

1.6 **EXTENDED WARRANTY AND MAINTENANCE SERVICE PROVISIONS**

.1 Provide complete service and maintenance of elevator system components during building contract and 24 month warranty period, from date of Substantial Performance of the Work, at no additional cost to Owner.

.2 Provide Maintenance Control Program (MCP) complying with ASME A17.1/CSA B44, and any other local authority rulings and requirements. MCP shall be turned over to the Owner upon completion and will be maintained as necessary.

.3 All work shall be performed by fully trained technicians during regular working hours of regular working days and shall include emergency 24-hour callback service.

.4 Use genuine parts and supplies produced by the manufacturer of specific equipment.

.5 Maintenance service to include systematic examinations, adjustments and lubrication of elevator equipment and repair or replace parts whenever required as per planned maintenance tasks and frequencies.

.6 Maintenance shall include regular service visits, at intervals of no more than every 32 days (once a month per elevator), plus callback service whenever requested by the Owner. For callbacks occurring outside of normal working times (emergency callbacks excepted), Owner will pay the overtime premium portion for labour, except for emergency callbacks required for the release of trapped passengers.

.7 Emergency callback service to release trapped passengers or in the event all emergence service within the building is lost, shall be available 24 hours a day, 7 days a week, shall be furnished whenever requested by the Owner. For emergency callbacks, no additional cost premium or overtime shift bonus charge shall be charged to the Owner.

.8 Elevator manufacturer shall provide 24-hour answering service as follows:
- .1 This answering service shall log instances of trouble calls and be equipped to dispatch maintenance technicians 4 hours a day, 7 days a week and 365 days a year.
- .2 A third party answering service may be used to fulfill this requirements.
- .3 Cost of dispatching shall be included in the monthly maintenance price.
- .4 No additional charges or surcharges shall be permitted for the Owner's use of this answering service.
- .5 Furnish Owner with the number of the answering service as well as any specific contract or designation number(s) that may be required to identify the caller.

.6 Where the answering service is changed or the answering service number is revised, the elevator manufacturer shall cover all costs associated with reprogramming voice communication equipment.

.9 Average callback response times shall be:
- .1 During regular working hours - 60 to 90 minutes.
- .2 For callbacks outside of normal working hours - 90 to 120 minutes.
- .3 For emergency callback response time during normal working hours - 30 to 60 minutes.
- .4 Emergency callback response time outside of normal working hours - 45 to 90 minutes.

.10 Other callback service requests as relayed through appropriate Owner personnel shall be provided under the following conditions:
- .1 For calls occurring during regular working hours, these callbacks shall be performed without additional cost premium to the Owner.

.11 Perform work without removing cars during peak traffic periods.

.12 Maintenance service shall not be assigned or transferred to any agent or subcontractor but shall be performed by the elevator manufacturer.

.13 Maintenance coverage shall also include the following:
- .1 Provision of burnt out signal indicators and bulbs shall be included.
- .2 Replacement of burnt out car top lights and pit lights as required, with Owner furnishing replacement bulbs.
- .3 Replacement of blown fuses in cab light and main power disconnects, with Owner furnishing replacement fuses.
- .4 Replacement of cab lighting fixtures and ballasts, with Owner being responsible for supplying replacement bulbs and ballasts.
- .5 Servicing, cleaning, repair, adjustment and replacement of cab ventilation fan.
- .6 Drive motor and control sets shall be maintained in good working order. Bearings, rotors, motor windings, stators, connections and connectors shall be periodically checked and reviewed for proper operation. Replacement of worn components shall be included under this maintenance service.
- .7 Operation and control circuits shall be checked for proper operations. Specification performance settings shall be maintained, except when requested in writing by the Owner to change such performances.
- .8 Replacement of all hoist ropes, governor ropes, as well as traveling cables and other hoistway conductors.
- .9 Replacement of burnt out or defective elevator signal fixture bulbs.
- .10 Tightening of elevator handrails and bumper rails plus the securing of loose or noisy cab enclosure or ceiling sections shall be included.
- .11 Adjustment of car operating performances, load weighing settings, door performances, leveling and all other system adjustments shall be periodically checked and readjusted to maintain specified performances.
- .12 Annual testing of fire service operation and emergency power operation with such tests being conducted during normal working hours.

.13 Maintain service log in machine room and record date and time of each service visit, along with brief record of corrective action undertaken during that visit. Maintenance personnel shall also record instances of callback service, including nature of problem and measures taken.

.14 Defective or worn components shall be replaced under this maintenance service at no additional cost to Owner.

.14 Maintenance work shall include all data logging and testing certification recording as required under CSA B44.

.15 Furnish Owner, at intervals of not more than three (3) months, with hard copies of all testing and certification records, where such data logging is carried out electronically.

.16 Maintain adequate stock of spare parts on site. Provide lockable metal cabinet within machine room, for storing spare parts, fuses, and other component cleaning compounds. Alternatively, equip service vehicles with necessary spare parts to ensure equipment down time is not extended because of a lack of readily available replacements.

.17 Every six months, furnish Owner with a written review and summary of callbacks and passenger entrapments that have taken place during preceding months. This report shall document not only the time and date of the call but also the reason for the call and actions taken to correct the problem found. Callback summary shall include all calls.

.18 Keep ‘as-built’ circuit diagrams up-to-date showing all changes and circuit modifications. Make such notation on the drawings in red coloured ink.

.19 The Owner reserves the right to reassign full maintenance service work to another qualified elevator maintenance company in the event a professionally qualified third party deems the elevator manufacturer to be deficient in performance of its maintenance duties and has been found negligent in completing noted deficiency items within 30 days (or other mutually agreed upon timeline) of receiving written notification of such deficiencies.

.20 All resulting and additional costs, as incurred by the Owner when maintenance services are reassigned, subject to an upset amount as determined by a qualified unbiased third party elevating Device Specialist Consultant, shall become the responsibility of the Contractor.

.21 Provide as required access to elevator pit and hoistway spaces for repairs, servings and testing of elevator pit drains and shaft fire alarm devices. Except for emergencies, access to pits and hoistways shall be scheduled to take place during regular scheduled elevator maintenance visits. At the time of each service visit, check pit spaces for water infiltration. Immediately advise the Owner of any water observed.

.22 Where the same component fails more than twice during the course of the warranty period and such component failure cannot be attributed to abnormal wear and tear, unintended use or other reason beyond the control of the equipment installer, then all such components as installed under these specifications shall be replaced (including labour) under warranty, at no additional cost to the Owner.

.23 Maintenance coverage shall not extend to the replacement and repair of worn or damaged components caused as a result of neglect, misuse, abuse or vandalism by forces other than maintenance contractor's personnel.

.24 Replacement of main line disconnect fuses will be the responsibility of the Owner.

1.7 **DELIVERY, STORAGE AND HANDLING**

.1 If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises. Additional labour costs for double handling will be the responsibility of the Contractor.

.2 Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 3 m x 6 m (10 feet by 20 feet) is required adjacent to the hoistway.

2 Products

2.1 **ACCEPTABLE SYSTEMS AND MANUFACTURERS**

.1 Acceptable elevator system and manufacturers:
- .1 Drawings and specifications are based on the 'MonoSpace 500' by KONE Inc. and shall be base bid, including but limited to the following components:
  - .1 Controller/drive type: 'KCM831' with 'KDM-40A'.
  - .2 Machine/motor type: 'MX20/G06:V001-4' with fan.
  - .3 Sling: Integrated car sling, 'ISCS16'.
  - .4 CWT and car guide type: 'SLG20'.
  - .5 Car safety block: 'SGB02- Type B'.
  - .6 Car governor type: Overspeed governor'OL35'.
  - .7 CWT frame type: Counterweight 'FCWT04'.
  - .8 Car guide rails: 'T127-1/B'.
  - .9 CWT guide rails: 'T89/B'.
- .2 If another manufacturer's equipment is used, any potential cost associated with modification of surrounding construction shall be accounted for in the base bid Contract Price.
- .3 If requirements or characteristics of lift equipment differ from that which is specified herein, such as: power requirements, electrical conductor size from control box to lift controller, motor hp size, or other such difference; list such differences at the time of bidding in accordance with the Contract Documents.

.4 Proposed alternatives shall meet eco-efficient operation and service of KONE products and the eco-efficiency performance requirements of the specified KONE MonoSpace 500 product.

.5 Alternatives by the following will be considered provided they meet the requirements as specified herein and are approved prior to purchase.

.1 'OTIS-GEN2' by Otis Elevator Company.

.2 Schindler Elevator Corporation.

.3 ThyssenKrupp Elevator.

2.2 MATERIALS

.1 Use components only which have performed satisfactorily together under conditions of normal use in not less than two other elevator installations of similar design and for a period of at least one year. Furnish names and addresses of Owners or managers of buildings, in which proposed combination of major components has so performed.

.2 Stainless steel sheet and plate: ASTM A167, Type 304, brushed finish. Sizes and shapes indicated.

.3 Pit ladder and hoist beams: Coordinate with Section 05 50 00 as required for installation of pit ladder and hoist beams.

.4 Resilient sheet flooring: In accordance with Section 09 65 16.

2.3 SOUND ISOLATION

.1 Include resilient pads to effectively isolate machine from machine beams or flooring.

.2 Prevent lateral displacement of machine.

2.4 CONTROL EQUIPMENT

.1 Controller:

.1 A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.

.2 All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.

.3 High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.

.4 Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC).

.5 Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the BS EN 12016.

.6 Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.

.2 Drive: A Variable Voltage Variable Frequency AC drive system shall be provided to develop high starting torque with low starting current.

.3 Controller location: Locate controller{s} in the front wall integrated with the top landing entrance frame, machine side of the elevator. One non-fused three phase permanent power in hoist way at top landing. A separate control space is not required.

2.5 HOISTWAY COMPONENTS

.1 Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.

.2 Buffers, Car and Counterweight:
- .1 200 fpm Compression spring type buffers shall be used.

.3 Hoistway Operating Devices:
- .1 Emergency stop switch in the pit.
- .2 Terminal stopping switches.
- .3 Emergency stop switch on the machine.

.4 Positioning System: System consisting of magnets and proximity switches.

.5 Guide Rails: Tee-section steel rails with brackets and fasteners.

.6 Coated Steel Belts: Five polyurethane coated belts with 12 high-tensile-grade, zinc-plated steel cords in each.

.7 Governor: Friction type over-speed governor rated for the duty of the elevator specified.

.8 Hoistway entrance door and frame components as specified in this Section.

2.6 ELEVATOR CONTROLLER CABINET

.1 Provide elevator controls in an EEMAC 12 ventilated galvanized steel cabinet mounted adjacent to or attached to the power unit.

.2 Provide controller with hinged doors, designed to allow ready access to all internal components.

.3 Controller shall house contactors, relays, switches, timers, fuses and other control and operating devices. Clearly label all components with permanently marked tags or designations, corresponding to the electrical circuit wiring diagrams. Provide similar switch and relay units of same manufacturer.

2.7 VOLTAGE CONTROL

.1 Include voltage control as follows:
- .1 Effect voltage control by means of uniformly varying ac voltage applied to motor.

.2 Include manufacturers standard AC variable voltage variable frequency drive system.

.3 Include solid state motor drive as follows:
- .1 Convert 3 phase, 60 hz ac to variable ac voltage for motor operation.
- .2 Use automatic closed loop control system.
- .3 Provide instant and noiseless response according to power required.
- .4 Conform to ASME A17.1/CSA B44.
- .5 Design circuitry with redundant systems to fail safe.
- .6 Filter power supply to give essentially ripple free current.
- .7 Design solid state devices to handle 200% current for 30 s and 300% for 10 s.
- .8 Eliminate surges on the ac line which might cause blowing of the dc line fuses or which might cause trouble in other equipment connected to ac line. Filter dc if necessary.
- .9 Modify frequencies emanating from rectifier drive which are objectionable to personnel or which interact with various parts of building.
- .10 Design motor to suit control system.
- .11 Automatically re-start equipment which has stopped due to ac power failure.
- .12 Withstand damage and do not malfunction due to any variation of power supply to a maximum of +/- 10% flux.
- .13 Cause no adverse effects on power supply, or other equipment connected to power supply, under operating conditions.
- .14 Include governor switch set to trip at no more than 90% of governor tripping speed; activated by overspeed in both directions.

2.8 BUFFERS

.1 Do not compress oil buffers when car is level with bottom landing.

.2 Use reduced stroke buffers and emergency terminal stopping devices where pit depth or overhead height does not permit installation of normal stroke buffers.

.3 Include buffer extensions where necessary to suit pit depth as indicated.

.4 Provide buffer switch on spring return buffers.

2.9 CAR GUIDE RAILS

.1 Provide steel "T" section car guide rails, complete with brackets and sliding rail clips. Size rails to accommodate a 1500 mm vertical span between adjacent guide rail supports, even when the actual distances between supports are less.

.2 Fasten rails to hoistway construction using fastening devices and members as provided by this Section.

.3 Accurately machined car guide rail joints. They shall have tongues and grooves in the ends and centre of each rail head and base, so as to form matching joints between the rail head and base.

.4 Maximum joint gap to be 1.5 mm. All rail joints to be filed smooth.

.5 Provide fitted fishplates to the back of each rail joint. Each fishplate shall contain no less than eight through bolts. Fishplates shall be accurately machined surfaces for all surfaces which contact the guide rails.

.6 Locate rail joints so fishplates will not interfere with the relative motion of the guide rail column with respect to rail clips, brackets and beams.

.7 Positioned and aligned car guide rails so they are within 3 mm plumb and parallel from top to bottom.

.8 Where rail shims are used, ensue they remain securely fastened, even though fastening bolts may become loose. Do not use shim packing for gaps exceeding 25 mm.

.9 Cut car guide rails off at the top so there is a minimum clearance of at least 50 mm between the underside of the hoistway ceiling or nearest obstacle above the rail head.

.10 Guide rails shall be cleaned, filed smooth and de-rusted before Substantial Completion of the work.

2.10 **ROLLER GUIDES**

.1 Equip car with roller guides mounted on top and bottom of car frame.

.2 Provide each guide with durable, oil resistant, resilient tired ball bearing rollers running on three finished rail surfaces.

.3 Do not lubricate guide rails. Maintain each roller on its respective guide in uniform contact with rail surface at all times by means of substantial springs or by resilient mountings.

.4 Provide guide operation which is inaudible to passengers in car or outside hoistway with car operating at rated speed and car fan turned off.

.5 Use tire material which will not develop flat spots after standing idle for 24 h under average environmental conditions.

2.11 **HOISTWAY SWITCHES**

.1 Provide normal terminal stopping devices at each top and bottom landing level. Arrange these enclosed switches so that as the elevator approaches either landing, a roller with a noiseless tread, mounted on a movable arm, will come in contact with cams mounted on the elevator car. The activation of this device will cause the elevator to automatically come to a smooth stop at that terminal landing. The switch roller shall engage the full surface area on the car cam.

.2 Provide a final terminal stopping device at the top and bottom of the hoistway.

.3 Operate final limits by a fixed car cam which is securely attached to the elevator car's structure.

.4 Locate switches so they will only be activated in the event the elevator travels a predetermined distance above or below the corresponding terminal landing.

.5 These switches shall be independent of the normal stopping devices.

.6 Through bolt final limit switches once the car has passed TSSA final acceptance inspections.

.7 Hoistway switches shall be of a type that can operate without noise being heard from inside the elevator cab whenever the ventilation fan is OFF.

2.12 HOISTWAY ENTRANCE

.1 Refer to 'Barrier Free Design' Article for additional requirements for entrance marking jamb plates.

.2 Hoistway doors and frames: Brushed stainless steel; 1.5 mm thick. Fascia panels constructed same as doors.

.3 Door and frame construction:
- .1 Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of 14-gauge (2 mm) sheet steel.
- .2 Doors: Entrance doors shall be of hollow metal construction with vertical internal channel reinforcements.
- .3 ULC rated for with applicable fire rating; test to CAN4-S104; sandwich panel construction, 32 mm thick minimum.

.4 Sills shall be extruded aluminum.

2.13 OPERATING PANEL AND BUTTONS

.1 Refer to 'Barrier Free Design' Article for additional requirements for elevator operation.

.2 Provide vandal, impact, scratch, burn and splash resistant, operating panel and hall lantern signalization, 'KSS 140 Series Signalization' by Kone.

.3 One operating panel per car with stainless steel faceplate mounted in each car, containing buttons with integral illumination corresponding to floors served, alarm button and "DOOR OPEN", "DOOR CLOSE" buttons and be complete with barrier free design as specified herein.

.4 One riser, with UP and DOWN buttons at intermediate landings, and single call button at terminal landings, each with integral illumination and faceplate, mounted on wall.

.5 Button Illumination:
- .1 Include LED illumination of each button in each landing and car operating fixture.
- .2 Illuminate corresponding "up" or "down" button and car button whenever call is registered. Extinguish illumination when call has been answered.

.6 Signal Illumination: Illuminate signal fixtures with sufficient intensity to produce distinct and well-defined indications under ambient lighting conditions.

2.14 **DOOR OPERATION**

.1 Refer to 'Barrier Free Design' Article for additional requirements for door operation.

.2 Automatic door operation: at each landing by means of power operator mounted on top of car.

.3 Door protective devices: multiple infrared light beams with solid state electronics providing extensive cris-crossed continuous scan across car entrance, unaffected by dust, humidity and vibration.

.4 Door operating sequence to minimize car and hall door open and close times. Provide independently adjustable door open times.

.5 Include arrangement specifically designed to minimize delays and return of car to service, should doors be prevented from closing for predetermined time.

.6 If doors are prevented from closing for approximately 10 s because of obstruction or operation of safety devices, automatically disconnect door control device and allow doors to close more slowly and recycle until obstruction is cleared. Sound alarm.

2.15 **NEXT FLOOR STOP FEATURE**

.1 In case of over-speed or tripping of overload relay stop car at next floor rather than make emergency stop between floors when serving between local floors.

2.16 **AUTOMATIC SELF LEVELING FEATURE**

.1 Install self-leveling feature which will automatically bring car to floor landings. Correct for over-travel, independent of operating device.

.2 Maintain car floor level within 10 mm of landing floor with two-way automatic maintaining leveling device.

2.17 **LOAD WEIGHING DEVICE**

.1 Include automatic load weighing device to:
- .1 Dispatch elevator from main terminal if filled to predetermined capacity;
- .2 Cause elevators to bypass hall calls without canceling them if elevator is filled to predetermined capacity.

.2 Arrange load weighing dispatch and load weighing bypass to be independently adjustable.

2.18 CAR PLATFORM AND ENCLOSURE

.1 Structural steel platform frame: filled with wood or steel subflooring. Threshold plate: durable and easily maintainable.

.2 Enclosure: Sheet steel panels attached to steel frame.

.3 Floor, walls and ceiling: 19 mm plywood, fire retardant treated surfaces and edges. Attach with flush mechanical fasteners.

.4 Enclose car on all sides except entrance, suitable for removing or resurfacing for maintenance purposes.

.5 Panels:
- .1 Removable, retained securely with hidden fastenings. Design for removal of panels from inside car.
- .2 Side panels: Stainless steel panels with rigidized finish.
- .3 Back wall: Stainless steel panels with polished mirror finish.

.6 Floor finish: Linoleum flooring (RSF2), in accordance with Section 09 65 16.

.7 Ceiling: Stainless steel panels with satin finish, complete with six (6) panels and six (6) round LED lights, ‘LF-88' by Kone.

.8 Skirting: Manufacturer’s standard stainless steel skirting.

.9 Lighting:
- .1 Include lighting providing a light intensity of 215 lx measured 0.75 m above floor. Totally enclose and conceal wiring and fixtures from view within car.
- .2 Refer to ‘Barrier Free Design’ Article for additional requirements for lighting.

.10 Ventilate by an exhaust air handling unit through roof and through concealed perforations at base. Limit total fan noise to 55 dB on "A" scale of General Radio Sound Level meter type 1551A from reading 1000 mm above floor with fan on high speed.

.11 Operating panel and face plate: stainless steel with illuminating call buttons.

.12 Indicator panel within car panel.

.13 Pad hooks: Stainless steel, permanently mounted at 2100 mm.

.14 Wall mats: one set canvas covered, padded with cotton wadding fill material and sewn.

.15 Furnish stainless steel license holders integral with return panel in each elevator car or control room to suit certificate issued by enforcing authority. Design holder with hidden or tamper proof fastening.

.16 Hand's free communication/speaker system:
- .1 Provide recessed mounted, hands-free, emergency telephone, with automatic dialing feature for dedicated line. Program to suit building manager's requirement. Provide vandal resistant mounting to prevent unit removal from cabinet.
- .2 Refer to 'Barrier Free Design' Article for additional requirements for hand's free communication/speaker system.

.17 Handrails: 100 mm high rectangular shaped handrails bent at each end as specified herein.

2.19 **FINISHING**

.1 Structural metal surfaces: clean surfaces of rust, oil or grease; wipe clean with solvent; prime two coats.

.2 Machine components: clean and degrease; prime one coat, two coats enamel.

.3 Field welds: chip and clean away oxidation and residue; wire brush weld; prime two coats.

.4 Galvanized surfaces: clean with neutralizing solvent; prime one coat.

.5 Wood surfaces not exposed to public view: one coat primer; two coats enamel.

.6 Baked enamel on steel: clean degrease metal surface, one coat of zinc oxide primer sprayed and baked; two coats of semi-gloss enamel sprayed and baked; color as later selected by Consultant.

2.20 **BARRIER FREE DESIGN**

.1 Comply with CSA B651 and City of Toronto Accessibility Design Guideline.

.2 Grab bars: 100 mm high rectangular shaped stainless steel handrails as indicated on drawings with bent ends, returned close to panels and removable from inside car, to be installed between 865 and 965 mm above the floor with a projection of 30 and 40 mm.

.3 Sound signals: Sound audible soft-toned voice control in car to announce floor level stops and doors closing and opening.

.4 Elevator controls and operation:
- .1 Elevator car doors require longer opening time. A minimum of 5 seconds before the doors start to close if hall call and 3 seconds if car call.
- .2 Elevator operation shall include raised tactile characteristics and braille placed immediately to the left of control button with numeral height to be 16 mm minimum.

.3 Hall button to be minimum 19 mm diameter and shall be installed with its center line 900 mm to 1050 mm above the floor. Hall buttons shall have visual signals to indicate when each call is registered and when each call is received.

.4 Car controls shall be installed so that all buttons are 19 mm minimum in diameter and are located between 890 mm and 1220 mm from floor in ascending order carried with visual and audible feedback to announce the floor number.

.5 Car doors shall have a reopening device, that will reopen the elevator door when an object is sensed between 125 mm and 735 mm above the floor.

.5 Entrance braille markers: A 50 mm high raised floor/car designation with braille provided on both jambs of elevator hoistway entrances at its center to be 1525 mm above the floor.

.6 Communication/speaker system: A two-way communication system and a hands-free speaker system shall be provided inside the elevator with the highest operating mechanism located a maximum of 1050 from finished floor.

.7 Lighting: Illumination levels at the car controls, platforms, car threshold, and landing sill to be minimum 10 lux.

.8 Stainless steel panels with mirror finish: Provide flat wall panels with mirror finish on rear wall.

2.21 EMERGENCY LIGHTING

.1 Include emergency lighting in each car as follows:

.1 Battery operated emergency lighting equipment, to CSA C22.2 No.141, to provide general illumination and 10 lx minimum illumination in car at operating panels and telephone cabinet for 4 h minimum.

.2 Key operated switch for manual testing of unit from within car.

.3 Battery unit of sufficient strength to support 100 kg person without causing malfunction or damage.

.4 Means to contain leakage or spillage of electrolyte.

2.22 EMERGENCY RECALL SYSTEMS

.1 Upon activation of building fire alarm system, automatically start or return elevator car to main floor level at rated speed. Connect fire alarm signal wires to controller for recall and emergency lighting. Open doors to allow passengers to exit and park car with doors closed.

.2 In event of power failure, provide sealed type emergency batteries in controller to lower car to ground level. Open doors to allow passengers to exit and park car with doors closed.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Verify that hoistway and pit are ready for equipment installation.

.3 Verify shaft and openings are of correct size and within tolerances.

.4 Confirm electrical power is available and of correct characteristics.

.5 Report defects in writing to Consultant.

3.2 **INSTALLATION**

.1 Install equipment in accordance with the Contract Documents, reviewed shop drawings, and in accordance with ASME A17.1/CSA B44, local codes and regulations. Position components so as to allow for future replacement or repair work to be undertaken, without having to dismantle or relocate other equipment.

.2 Connect to electrical services as provided.

.3 Provide wiring and conduit from electrical disconnects to car controller. Coordinate location of controller and electrical connection routing.

.4 Provide suitable rail bracket fasteners and make secure attachments to hoistway construction.

.5 Provide inserts for placement in concrete form work or self drilling expansion shell bolt anchors that will perform to four times rated pull-out load.

.6 Set entrance frames in proper alignment with car platform. Fasten frames to available wall and floor supports.

.7 Exposed Work within car enclosure and hall landing entrances shall be fabricated in true planes. Metal and wood sections shall be installed flat, be securely fastened and aligned so as to be straight and true. They shall be free of visible imperfections. Joints shall be accurately fitted, aligned and installed in same plane.

.8 Install entrances so frames are plumb within maximum variation of 3 mm, measured between entrance landing sill and header, top to bottom.

.9 Install hoistway door sills, frames and headers in hoistway walls. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.

.10 Balance car.

3.3 **WIRING**

.1 Install wiring in accordance with reviewed shop drawings. Tie wrap conductors.

.2 Provide wiring to connect all parts of the elevator equipment including interconnecting wiring running between controller and elevator hoistway.

.3 Wiring to be stranded or solid, to suit manufacturer's specific requirements. Wiring shall be provided with flame proof and moisture resisting outer cover.

.4 Do not parallel conductors to increase current carrying capacity unless individually fused.

.5 Wrap spare conductors together and labeled with their ends insulated.

.6 Solder or fasten wiring connections to terminal strips or studs using approved mechanical fasteners.

.7 Provide wiring harness where multiplicity of conductors are terminated at remote panel terminal strips.

.8 Clearly identify controller components with designations corresponding to those used on electrical circuit drawings.

.9 Provide insulated bushings around wiring openings where traveling cable and other multi conductor cables are run through openings in car enclosure.

.10 Wiring connections to door detectors shall be protected from chaffing and splitting.

.11 Where liquid tight conduit is used, provide conduit supports and fastenings at intervals of not more than 1500 mm.

.12 Use proper anti shorts in all conduit connections.

.13 Provide hoistway troughing and conduit.

.14 Run hoistway wiring within conduit or troughing.

.15 Provide ETT type flexible traveling cable, complete with flame resistant and moisture proof outer cover. Provide traveling cables of identical size and diameter and ensure each cable’s loop has a similar hanging radius.

.16 In all hoistway wiring risers, remote panel conduits and traveling cables runs provide a minimum of 10% spare conductors. Identify, tie wrap and isolate ends of all spare conductors.

3.4 **FIELD TESTING**

.1 During installation, Consultant may carry out periodic Site inspections to gauge progress of the work and assess monthly invoices.

.2 Provide full co-operate with Consultant to allow unrestricted access of the installation, hoistway, pit and car platform.

.3 Perform all tests and inspections as required under ASME A17.1/CSA B44 and Authorities having Jurisdiction.

.4 Include all costs of Provincial registration, design submission and acceptance inspection fees.

.5 Coordinate and schedule with TSSA acceptance inspections.

.6 Performance and operation or commissioning inspections shall be carried out by the Owner's designated representatives and shall be scheduled to take place before TSSA acceptance inspection.

.7 During commissioning inspections, supply sufficient test weights to demonstrate performances under full load and no load conditions.

3.5 **EQUIPMENT PERFORMANCE AND ADJUSTMENT SETTINGS**

.1 Adjust elevator to attain the following performance criteria:
- .1 Car movement on guide rails: smooth movement, with no perceptible lateral or oscillating movement or vibration.
- .2 Car speed variation: maximum 5% in lifting rated load.
- .3 Car speed variation: maximum 10% in UP or DOWN speed, empty to full rated load.
- .4 No noticeable shift in acceleration or deceleration rates.
- .5 Car leveling accuracy shall be maintained at +/- 6 mm, under all load conditions.
- .6 Guide rail alignment: plumb and parallel to each other within 3 mm.

.2 Adjust door opening and closing times to suit handicapped users in accordance with Consultants instructions.

.3 Adjust automatic floor levelling feature at each floor.

3.6 **CLEANING**

.1 Remove protective coverings from finished surfaces and components.

.2 Clean surfaces and components ready for inspection.

END OF SECTION